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Cement and Engineering News

Vol. 35 Chicago, JANUARY, 1923 No. 1

What Cement Is Doing to Help Reduce Fire Hazards

Fire losses in the United States in 1921 were more than half a billion dollars.

Fire loss adjustments made by insurance companies in the United States and Canada during the past fourteen years amounted to $3,410,752,600. The average yearly loss was $243,625,200. The loss for 1920 was $330,853,-925.

Losses from fire in the United States average $3 per capita per year. France has a per capita loss of 49 cents; Great Britain, 33 cents; Germany, 28 cents, and Holland, 11 cents.

During the past fourteen-year period our fire losses were 28.1 per cent of the value of new building construction. In 1920, although an abnormal amount of building was done, the fire losses were 23.5 per cent of the value of new buildings.

Startling as these losses are, they do not tell the whole story. They represent only the actual insurance adjustments made. They do not take into account losses due to the fact that buildings are seldom insured for more than 80 per cent of their full value, nor do they include losses not covered by insurance. The insurance adjustments made probably do not exceed 70 per cent of actual fire losses, including both insured and uninsured.

The surest safeguard against loss by fire is a building so constructed it cannot burn.

Reinforced concrete represents the highest type of fire-resistive construction. Concrete is practically maintenance free. Concrete grows stronger as it grows older.

Concrete homes are protecting the American family from the dangers of fire.

Concrete apartments, hotels, office buildings and factories, house thousands of workers in our cities. In these, concrete has reduced the danger from fire to a minimum.

Concrete construction is a means of reducing fire insurance premiums.

If there is any building that should be made absolutely firesafe it is the schoolhouse.

In the United States a fire occurs every day in some school.

In a properly planned school building, in which concrete has been consistently used throughout, fires of dangerous proportions are practically impossible.

The Portland Cement Association is constantly cooperating with all established agencies concerned with the problems of fire prevention.

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The Association has engineers who confer constantly with builders and architects with a view to eliminating fire hazards.

Aiding the work of fire prevention is typical of the daily service of the Portland Cement Association.

"No Profiteering," Says Cement Maker; Quotes High Costs

The Sandusky Portland Cement company resents charges widely made that cement companies are profiteering. It produces figures to show that its costs are constantly rising and why it is necessary to boost prices. The following costs apply to coal used extensively in burning cement, says the company's analysis.

Cost per ton first four months 1922, $4.02.
Cost per ton months of May and June, $4.85.
Cost per ton July 1 to 15, $9.64.
Cost per ton July 16 to 31, $10.64.

"It takes 200 pounds of coal to burn one barrel of cement," the statement continues. "Therefore, every $1 per ton on cost of coal equals 10c per barrel on cost of finished cement.

"It is readily seen that the one item for coal entering into the cost of manufacturing a barrel of cement shows an increase of 66c per barrel during the last 15 days of July over the first four months of the current year, with no immediate prospects of relief.

"The first four months of this year we secured all needed common labor at 25c to 28c per hour. Today we are paying for some classes of labor 35c per hour, or an increase of 25 per cent. All semi-skilled and skilled labor costs in like proportion.

"During the winter of 1921-22, cement sacks could be purchased at 9½c and 10c each; today the cost is 16c, an increase of 6c per sack, or $6,000 per car. We still charge but 10c for each sack. We purchased our last car of 100,000 sacks on June 28, 1922. We have purchased 500,000 sacks since January 1. This last purchase was due to Medusa sacks not being returned as promptly as might be nor in proportion to increased shipments due to heavy storage on part of contractors."

Pumps

Aurora Pump & Mfg. Co., Aurora, Ill., is distributing a circular describing their pumps for sand and gravel washing plants. Those interested in this line of equipment may obtain information upon application to the company.

Cement Association Reviews Twenty Years' Work

Announcement of New Technical Activities Made at Annual Meeting

Last month the Portland Cement Association held in Chicago its twentieth anniversary meeting. Outstanding in interest were the announcements that the association's laboratory was beginning a study of the constitution of portland cement and that the facilities of the laboratory were to be increased by the addition of a 2,000,000-lb. testing machine. Reports of the board of directors and of the president disclosed a satisfactory year in the industry, with total shipments for 1922 estimated at 110,000,000 bbl., or 12 per cent above the country's previous high record. The attendance was the largest in the association's history—302 individuals, representing 72 of 86 member companies.

The address of the retiring president, L. T. Sunderland, of the Ash Grove Lime & Portland Cement Co., Kansas City, laid stress on the opportunities ahead, contending that there is not only much need for broader and more persistent educational work but for additional research into the uses and character of the product. He declared that the association's newspaper advertising has been effective in informing the public regarding the industry.

Committees Report

The Committee on Technical Problems, besides announcing the research into the constitution of portland cement (which will be carried on by Dr. J. C. Witt), placed stress on the importance of a comprehensive study now being made of the action of alkali on concrete. Field tests under a wide variety of conditions and with many mixes, as well as laboratory studies, are under way. The laboratory staff, now numbering 35, was strengthened this fall by the addition of H. F. Gonnerman. Gratification was expressed at the widespread acceptance and use of the proportioning tables based on the Abram's cement-water theory.

The Committee on Conservation listed a number of studies under way looking to economy in production.

A history of the portland cement industry, written by Robert W. Lesley and John B. Lober, past-presidents, was announced as having been completed.

F. W. Kelley, of Albany, N. Y., president of the Helderberg Cement Co., was elected president of the association for 1923. With him will serve as vice-presidents, Blaine S. Smith (Universal) and L. R. Burch (Atlas) as treasurer, Col. E. M. Young (Lehigh), and as newly-elected directors, Carl Leonardt (Southwestern), W. D. Lober (Vulcanite), L. T. Sunderland (Ash Grove), C. B. Condon (Hawkeye), F. H. Smith (Lawrence) and Loring A. Cover (Security).

A gala banquet in honor of the close of the first twenty years of the association's life terminated the meeting. John R. Morron, president of the Atlas Portland Cement Co., New York, and Rev. David J. Evans, Th. D., of Kansas City, were the speakers. Mr. Morron paid high tribute to those who had successfully led the association in the past, and recalled that at the association's inception, in 1902, the industry's annual production was only 17,000,000 bbl. whereas this year it will be in the neighborhood of 110,000,000. As for the future, he suggested that the industry should have a man who would stand to it as Will Hays does to the motion-picture industry and Judge Landis to baseball.

An index to the industry's contribution to the public, he said, was furnished by data showing that "a bushel of wheat, a bushel of corn, a ton of hay, a pound of butter, a barrel of flour, a tierce of lard, a side of bacon, a barrel of salt, a pound of sugar, a bushel of potatoes, a bale of cotton, a ton of coal, a ton of steel rails, a thousand bricks, or the wages of a laboring man, in July, 1922, would purchase from 30 to 250 per cent more cement at the plants, than in 1892.

Mr. Morron also showed that bituminous coal delivered at his company's largest plant during three months of 1922 cost more per ton than was received for the manufactured product in which the coal was used.

Industry's Importance

"The cement industry," continued Mr. Morron, "handled millions of tons of stone, inert and useless, blasted from field and hillside; guided through scores of intricate processes, and converted at last into impalpable powder shipped to every nook and corner of our land. As if by the magician's wand, transformed again to stone,

"to make safe and sanitary the isolated home of the farmer;
"to house the product of his field in silo and in elevator;
"to span alike stream and river and chasm;
"to revitalize the value of town property in making possible the massive and towering architecture of our cities;
"to build the tunnels and subways through which the weary worker speeds in comfort and in safety to his country home;
"to girdle the hemisphere with permanent roads as smooth and hard as the floors of palaces;
"to cut in two the maritime distance from coast to coast and to make possible the union of our Atlantic and Pacific oceans;
"yes, and to build the very foundation upon which rests our Goddess of Liberty who beckons and guides the oppressed of other nations to our shore.

"Broadcast and advertise these facts, and the government will join with the public, not in criticism but in marveling at what one industry has added to the progress of the generation without undue profit and without undue gain."

Dr. Evans, in a discussion of industrial progress, called attention to the tendency of leaders of industry to take leadership, as well, in matters of social progress. Only by industry itself righting its wrongs—of low wages, excessive hours, unhealthful working conditions, etc.—could it hope to ward off the interfering hand of government. Co-operation in industry had accomplished much, as the work of the Portland Cement Association showed, but he believed that a further step was desirable, in a "roundtable of industry," at which the leaders of many industries could come together for the solution of the broader industrial problems.

Embellishing Concrete Sills

Walter O. Lloyd is a contractor and builder of Poughkeepsie, New York. On his work he has occasion to use a considerable amount of concrete sills and artificial stone and the method he uses to obtain a high class finish is interesting. When mixing the concrete he places granite or marble chips made up with white Portland cement in the facing to a depth of about 2 in. After curing, a stone cutter pitches the rock face, which brings out the texture and gives a pleasing appearance.

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New President of Portland Cement Association

F. W. Kelley, president of the Helderberg Cement Co., Albany, N. Y., was elected president of the Portland Cement Association at its annual meeting in Chicago last week. He comes to the highest office in the organization after many years of service as its treasurer and as chairman of its Committee on Technical Problems. An engineer by education (Cornell, M. E., '93) Mr. Kelley's first work was in the experimental department of the Consolidated Car Heating Co., of Albany, of which , by gradual promotion, he soon became general manager. His connection with the cement industry began in 1900 when he was made vice-president and general manager of the Helderberg company, just then in the process of changing its mill from a natural to a portland cement plant. He became president of the company in 1914.

The many difficulties involved in the manufacture of the more exacting product first aroused that interest in the technical problems of both production and use of cement which has characterized his work in the Portland Cement Association and which won for him his ten-year chairmanship of the Committee on Technical Problems. The bearing of that committee's activities on the association's work is readily appreciated by recalling the technical basis which has underlaid the major efforts of the association. Outstanding in the committee's accomplishments is the establishment of the Structural Research Laboratory.

Civic Activities

Mr. Kelley's energies, though heavily drawn on by his principal business and his association duties, have extended to many other fields. A leader in his own business community, he is now president of the Albany Chamber of Commerce, vice-president of the Albany Hospital, trustee of the Albany Medical College, director of the National Commercial Bank & Trust Co., and trustee of the City Savings Institute. His services to the Albany Hospital have been especially notable in that with the support of the professional staff he has been instrumental in introducing business standards into the accounting and hotel features of the institution.

His varied business activities have been matched by his work in professional societies. He is a member of the A.S.M.E. (chairman of its Cement Section), the A.I.E.E., the A.S.T.M. (on the executive committee of C-1), of the Joint Committee on Concrete and Reinforced Concrete, the Albany Society of Engineers, and of the Society of Engineers of Eastern New York (holding the presidency this year).

Rounding out his many sidedness is a sustained interest in rowing at Cornell, an interest born of his year in the freshman and two years in the varsity boat and capped by a long presidency of the Cornell Crew Association. Characteristic of the man is his belief that he owes much of his business progress to this crew experience—robust health and never-to-be-forgotten lessons of teamwork and concentration.

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Cement Wash—Should It Be Used?

By Edward D. Boyer, Cement Expert

When a coating is needed for covering a concrete, stucco or masonry surface, the most natural impulse is to consider a Portland cement wash. What is easier than mixing up dry cement and water in a pail to form a thick paint and brushing it on the surface to be covered? And yet the coating thus secured very often is disappointing because it becomes dusty and chalky, easily rubbed off; or hair-cracks, flakes off and gives a patchy appearance. On the other hand, some users of cement wash point to satisfactory results. Because of this difference in results obtained, it is apparent that there is some factor of manipulation which brings success in some instances and failure in others.

Some builders draw an analogy between a whitewash and a Portland cement wash but actually the action of the two coatings is entirely dissimilar. The ordinary whitewash is composed principally of lime and its hardening upon a wall surface is not a matter of hydration (combination with water) but is due to the absorption of carbon dioxide from the air which changes the hydrated lime into carbonate of lime. Even when lump lime is used for making white-wash, it is thoroughly hydrated during the mixing with water. A Portland cement wash, on the other hand, depends on the full and thorough hydration of the cement and this consumes a considerable period of time so that the presence of sufficient moisture for the thorough hydration is essential.

When cement wash is applied to a wall surface it is quite often exposed to the drying and evaporating action of sun and wind, which may remove practically all the water within a half hour or an hour after application. The material of which the wall is constructed also may be of a porous nature and will absorb very readily the moisture from the coating. The initial set of Portland cement rarely if ever takes place earlier than one hour and usually requires two or three hours. This means that if the water contained in the wash is evaporated or absorbed in about one hour the cement does not have opportunity to properly hydrate and the coating becomes dusty or flaky and of very little strength.

In those cases where Portland cement wash proves satisfactory, this result is probably due to extraordinary care to prevent loss of water from the wash combined with especially favorable conditions of the work. For example, the surface may be of non-absorbent character or it may be located in such a place that it is protected from sunlight and wind. In addition, the builder may realize the necessity of preventing the loss of moisture from the wash and may well wet down the surface before applying and then protect the wash by hanging wet cloths over the surface or gently spraying it as soon as possible after the application of the coating.

Conclusion

In deciding upon the use of Portland cement wash it therefore should be borne in mind that the results cannot be depended upon with certainty unless conditions are exactly right and unless extreme care and unusual precautions can be taken in the application. When results are not satisfactory it is a conclusive proof that conditions or application methods were such as to allow the loss of water necessary for proper hydration of the cement.

It is, therefore, our opinion that a so-called cement wash—that is, neat cement mixed with water—should not be used; and that where some coating is required one of the cement coatings manufactured for this purpose be used.

Intimate Facts About the Origin, Manufacturer and Use of Lime

"A Job That Took a Million Years, or the 'Tale of a Clam.'" This is the title of a very interesting illustrated booklet giving the story of the commonplace article, lime, with a most uncommon history. This story is written to help people realize what an important part lime plays in our daily life, and tells some of the intimate facts about the origin, manufacture and use of lime, facts gained in experience during 16 years as manufacturers and distributors of lime.

The book (a particle reproduction of the article follows herewith) is 8½ in. by 11 in., 16 pp., with paper covers, and was produced by the C. C. Stockford Company, Advertising, Toledo, Ohio, for the Ohio Hydrate & Supply Co., Woodville, Ohio.

Ordinarily most of us look upon lime as a very commonplace article. In fact, to many of us it merely means "plaster," and there we let our thoughts stop. But the creator has endowed each of us with imagination by which even the most prosaic of things can be made interesting. Let us call upon our imagination to see if something of more than ordinary interest cannot be learned about lime.

Briefly stated, lime is the product derived from heating the raw limestone until the carbon dioxide gas (CO_2) has been expelled. Geology tells us that limestone is the calcareous deposit of various forms of marine life resembling our present-day clams and oyster. These masses of shells and animal remains were stratified and compacted upon the bottom of the sea by the never-ending and untiring action of the water.

Thus nature carried on her work for centuries, a period of years far beyond the comprehension of man. Finally, however, through an upheaval of the earth's crust, these deposits appeared above the sea level as limestone ridges and outcroppings.

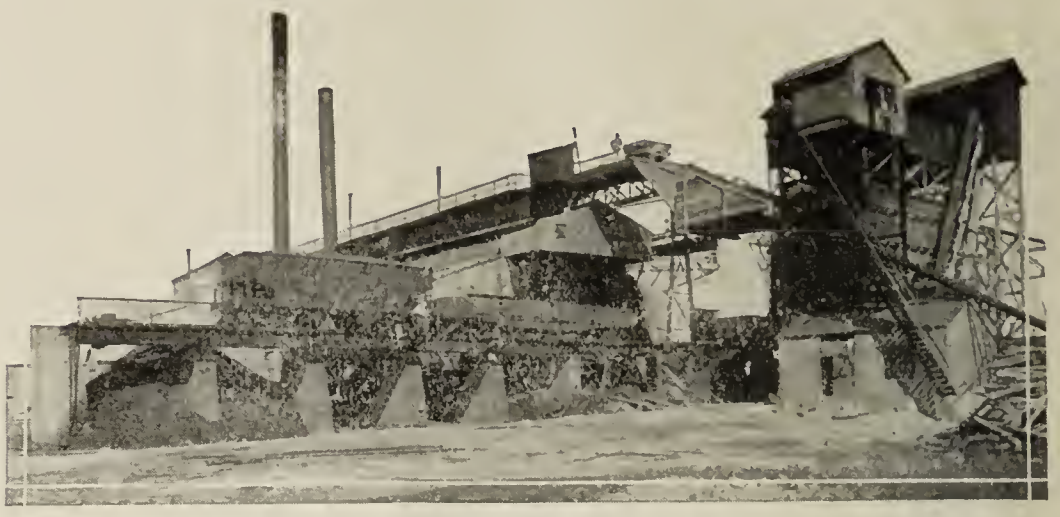
From a purely chemical standpoint there are two kinds of limestone. One is made up of carbonate of calcium while the other consists of calcium and magnesium.

This last, with its high content of magnesium, is known as dolomitic limestone. It is from this dolomitic formation that the best grades of finishing lime are made, this being due to certain local natural physical conditions which scientific experts have failed accurately to explain. It is generally recognized that hydrated lime made from this rock is noted for its whiteness, purity, plasticity and easy spreading qualities.

One of the first operations necessary in the establishment of our plant was the removal of the top soil or earthly overburden. This was done to insure a clean product and to prevent any foreign substance from getting into the kilns.

The next step was the drilling and breaking up of the rock by explosives. The masses were then broken into fragments of about 6-in. cubical dimensions, suitable for burning. These fragments are loaded into dump cars and started on their journey toward the ultimate sack of lime.

Fig. 1 shows the bottom of the quarry with several cars loaded ready to go up to the kilns



Showing Means for Feeding Kilns.

One of Firing Floors for New Battery of Kilns.

A Partial View of Center Firing Floor.

and one car going up the incline on its way to the top. Arriving at the top, the car is attached to an electric engine which hauls it to one of the kilns into which the load is dumped for burning.

The man who handles this part of the work can be plainly seen in the illustration at the extreme top of the trestle. Throughout the entire day his task is to pilot the loaded cars to the ever-burning kilns in order that the stream of finished product may not stop. When it is remembered that the raw limestone must be heated to 1800 to 2000 deg. F. to drive off the car-

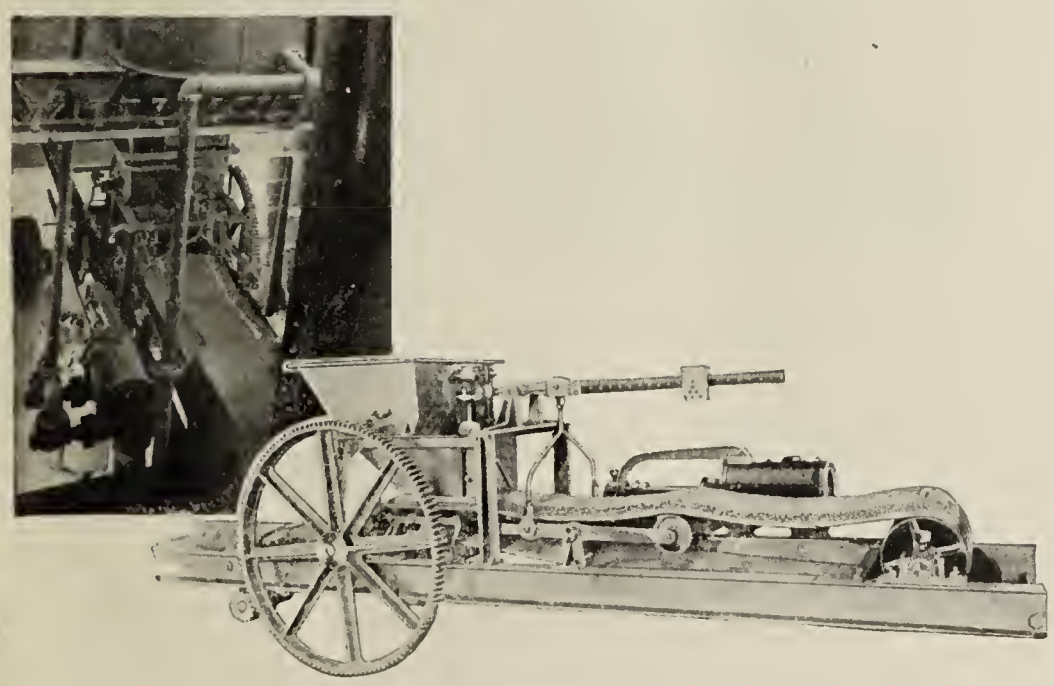
Fig. 12.—Where Our Famous Dolomitic Lime Comes From.

bon dioxide (CO_2) one can begin to appreciate the job that confronts the fireman in this immense plant.

It may not be amiss at this point to call attention to the character of our quarry. From the point where the overburden or surface dirt is removed to the extreme depth of the quarry the rock is entirely free from loam or dirt pockets. It is practically pure limestone, producing a like measure of purity in the finished product.

The fine particles of stone or waste product which accumulates on the floor of the quarry and which is too fine for burning is gathered and sold for chemical purposes for which it is particularly well suited. The fluxing stone, or raw dolomite, is used in concrete work, road building, etc.

Firing of lime kilns is carried on very systematically. Our kilns are under fire day and night for a period of 8 to 12 months during the year, depending on the life of the fire brick lining and business conditions. The furnaces are charged every 30 minutes and the fires are thoroughly cleaned every 4 hours after each draw. The coal does not come in contact with the stone but is burned in furnaces on opposite sides of the shaft through which the stone passes and the flames and gases from the fuel, tempered with steam introduced below the burning coal, are drawn up through portholes into the heated stone where it liberates the carbon dioxide.



Pyrometers in Action.

Fig. 8.—Aerator Which Cools Lime as It Comes From Hydrator.

This method of flame burning of lime explains why the lime comes out a pure white, free from all ashes and from all taint of coal smoke. Also, this method practically removes any possibility of overburning so common to the ordinary, old-style method.

It is essential that the tremendous heat necessary to burn limestone be maintained quite uniformly throughout the burning process in order that all the stone may be properly burned. Only in this way can uniform results be realized, which fact is one of the reasons for the uniform and satisfactory quality of our product, possible to do this work at slight expense.

It is truly inspiring to watch the dumping of the kilns and to note the remarkable whiteness and purity of the burned stone. This impression is further intensified as the burned stone passes on into the crusher and through the later processes where purity is emphasized at every step.

The lime is still hot when drawn from the kilns but, after it is allowed to cool, it is carefully picked over to separate any overburned or underburned pieces which may come through. This done, it is carried to the huge crushing machine at the further end of the cooling floor by means of an endless pan conveyor.

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As these great heaps of burned lime are picked over there can still be found many traces of our friend, the clam. Although thoroughly burned to the point of disintegration he still maintains enough of his original shape to disclose his identity. But once he reaches the crushing and pulverizing machinery he loses all identity in the immense mass of similar material which has been reduced to an almost powdery fineness.

It is at this point we approach the most interesting operation in the production of hydrated lime. From the quarrying of the stone, its transportation to and charging of the kilns, its burning and final drawing out as burned lime seems rather prosaic. But from here on it is found that machines have been made to excel even the dexterity of human hands, for human hands are not again to touch the product until delivered to the ultimate user.

The crusher reduces the burned lime to a pulverized

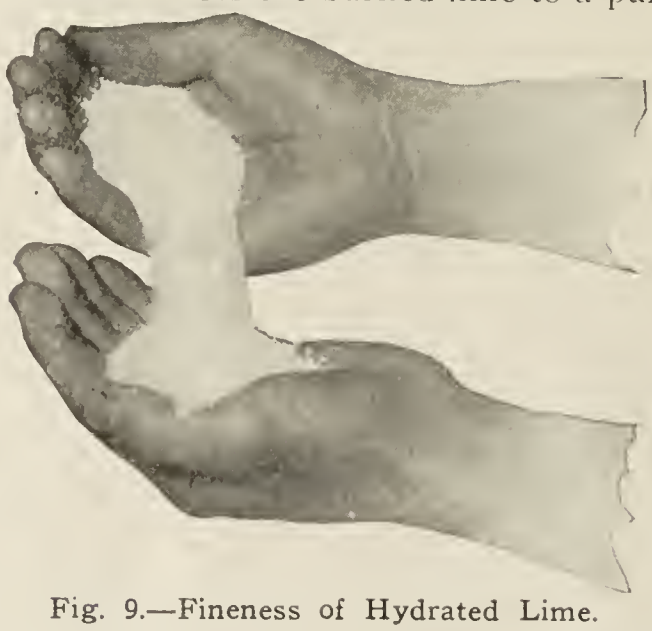


Fig. 9.—Fineness of Hydrated Lime.

state, from whence the ground mass is conveyed into the huge bin immediately behind the crusher. From this bin it goes by screw conveyor to the elevator and thence to a feeding hopper above the poidometer.

As the lime enters this feeding hopper it passes through the poidometer, which machine measures and weighs the lime with unerring accuracy and precision.

From the poidometer the lime passes into the hydrator, passing over an endless belt which is operated by an eccentric which also automatically pumps the required amount of water into the hydrator exactly in proportion to the weight of lime delivered by the poidometer.

As the lime passes into the hydrator it is constantly agitated by huge plows while being subjected to moist steam from which the moisture is absorbed by this slaking process. Entering the hydrator at the top the lime passes over eight levels in the process of hydration, coming out at the bottom completely slaked.

Fig. 10.—A Bag Is Placed Under the Bates Valve Bag Packing Machine and in a Few Seconds Is Filled and Machine Automatically Shuts Off.

As the lime comes from the hydrator it is too hot for packing, therefore it is passed over an aerator which cools it sufficiently for further handling.

From the aerator it passes through the Raymond mills where it goes through an air separation process which removes even the tiniest particle of overburned or underburned lime which may be carried through the crusher.

Some idea of the thoroughness of this machine may be gained from the illustration which shows two hands dipped into the hydrate. After passing through the Raymond mills the lime is then forced by a current of air, induced by rapidly revolving fans, to huge storage bins above the packing room. From these bins the

Fig. 11.—Part of New Plant With Old Plant in Background Conveying Equipment Furnished by Webster Mfg. Co.

lime is placed in valve bags by means of specially designed automatic machines, as shown in Fig. 10.

This battery of bagging machines has a capacity of 20 bags per minute, or a total of 24,000 bags per day of 20 hours. Since the standard paper bag holds 50 lbs. of lime, the total shipping capacity of the plant is found to be 600 tons of hydrated finishing lime per day.

From the bagging machines the lime is either loaded directly into cars or conveyed into our warehouse for

storing. This one feature of our equipment is especially important since it enables us to make shipment at any time regardless of the weather.

Not only are all loading operations protected but further precautions are also taken for the protection of our customers.

Nearly everyone knows the common condition of many freight cars and their tendency toward general disrepair. To remedy this condition and to furnish tangible evidence of our conception of service we maintain a complete crew of men whose time is devoted to repairing cars and fitting them properly to carry our shipments.

In the first place our product is put up in extra heavy rope paper bags of 10 and 50 lbs. capacity in order to reduce the loss of breakage in handling. Then we go one step further by lining the sides and bottoms of every car with extra heavy paper, for we have found that this precautionary measure does much to prevent loss of goods to our customers and consequent dissatisfaction.

The question is sometimes asked: Why is hydrated

Fig. 6.—Hydrator Where Lime Is Scientifically Slacked.

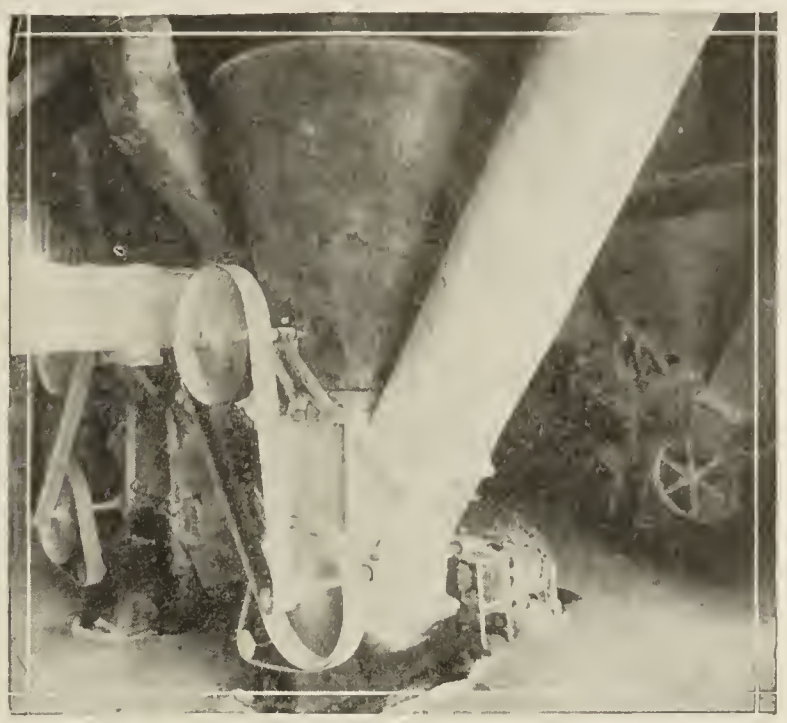
lime preferred over lump lime? Several reasons exist for this preference, depending somewhat upon the purpose involved.

The use of lump lime necessitates the aging of the putty or mortar before it can be used. The use of Ohio hydrate lime makes this aging unnecessary because the lime comes to the job already slaked. Guess work and careless workmanship are almost entirely eliminated through the aid of mechanical processes of scientific accuracy which insure uniform quality of product.

Then, too, Ohio hydrate lime is more convenient to handle, hence reduces the labor cost to both the dealer and the contractor, with little or no danger of waste. It can be stored indefinitely in a dry place with no resultant fire hazard. Because of the method of hydration it is uniform in quality and is practically free from core and overburned particles.

Another very distinct advantage is the elimination of any possibility of "drowning" or "burning" the lime in the slaking process. Such disastrous results are not at all uncommon where the required quantity of water is a matter of guesswork on the part of the workman.

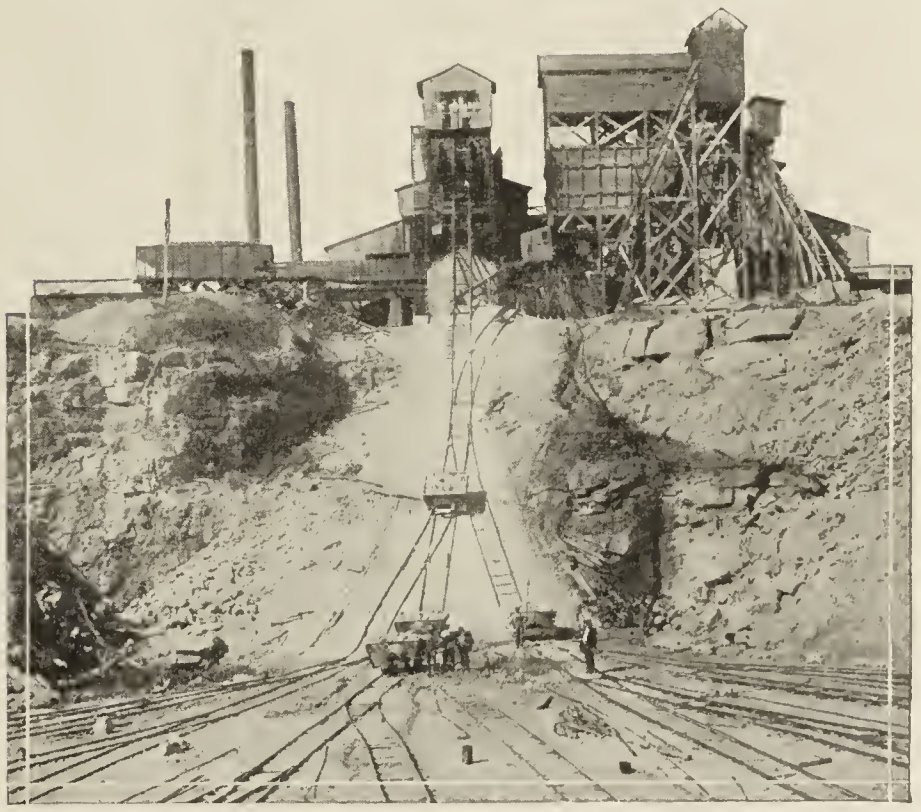
That is one reason why Ohio hydrate products are uniformly dependable. Mechanical methods of hydration (or slaking) insure a uniformity of product that is vitally important to the user. It is also well to remember that Ohio hydrate products are guaranteed



One of the Pulverizing Mills.

to meet the standard specifications for lime as required by the A. S. for T. M.

A report showing the analysis of Ohio hydrate and limestone has been prepared by E. L. Conwell & Co., Inc., in which both limestone and hydrated lime show



Incline and End View of Work of Ohio Hydrate & Supply Co., Woodville, O.

low content of impurities characteristic of the limestone of northern Ohio.

	Limestone.	Hydrated lime.
Silica	.18	.20
Alumina	.23	.22
Iron oxide	.07	.04
Total impurities	.48	.46
Calcium oxide	31.88	49.46
Magnesium oxide	19.68	31.90
Loss on ignition	47.82	18.14
Total	99.46	98.96
Fineness, passing No. 30 sieve		100.00
Passing a 200 sieve		83.03

Uses of Ohio Hydrate

Sometimes we are asked for a list of the places or classes of work where Ohio hydrate dolomitic lime can be used advantageously. The easiest answer to the question would be to say, "anywhere," but that, of course, is not sufficiently specific. For the convenience of those interested in the subject the following list is given as representing a general classification of the kinds of work where our products can be used with decided advantage.

Fig. 5.—Crusher Which Reduces Lump Lime to Pulverized State.

Then follows a list including white coating, scratch and brown coats, exterior stucco work, water-tight concrete, lime-cement mixtures, mortar, cold water paints, etc. About seven pages are devoted to a description of the uses of Ohio hydrate in which are given numerous pictures of prominent buildings in the United States on which the product was used. These show the use of the hydrate for the various purposes enumerated above.

It is all very well for one to say, "See what I have done," but when analyzed it is invariably found that many helped.

Therefore, while justly proud of the progress we have made, we are also glad to point with appreciative pride to the loyal support given us by the following firms whose products and efforts contributed their respective parts to the construction of our plant:

Engineering and Hydrating—Schaffer Engineering & Equipment Co., Pittsburgh, Pa.

Engineering and Erection of Building—Massillon Bridge & Structural Co., Massillon, Ohio.

Machinery and Equipment—Webster Manufacturing Co., Chicago, Ill.

Air Separating & Grinding—Raymond Bros. Impact Pulverizer Co., Chicago, Ill.

Bagging Machinery & Bags—Valve Bag Company of America, Toledo, Ohio.

Motors—Lincoln Electric Co., Cleveland, Ohio; Ideal Electric Co., Mansfield, Ohio; Allis Chalmers Co., Milwaukee, Wis.

Air Compressors—Ingersoll-Rand Co., New York City.

Hoisting Machinery—Lidgerwood Co., New York City.

Stone Handling Machinery—Barber Green Co., Aurora, Ill.

Electric Drilling Machinery—The Loomis Machine Co., Tiffin, Ohio.

Dr. Spencer B. Newberry

Born 1857, Died Nov. 28, 1922

News of the death of Dr. Spencer Baird Newberry, head of The Sandusky Cement Company of Cleveland and for many years an outstanding figure in the portland cement industry, has come as a great shock to his personal and business friends and to the trade in general. He was stricken at the wheel of his car on Tuesday, November 28, while driving through the downtown district of Cleveland on the way to his office.

Dr. Newberry was born in 1857, and for a number of years following his graduation from Cornell was Professor of Chemistry in that institution. In 1892 he

founded The Sandusky Cement Company with a mill at Bay Bridge, Ohio. Serving for a number of years as General Manager, he was later elected President, which position he held until his death.

Under his management, the business expanded both in volume and in production units, the original Bay Bridge plant being supplemented by others at York, Pa., Toledo, Ohio, Syracuse, Ind., and Dixon, Ill.

Of the many important contributions that Dr. Newberry has made to the development and advancement of the industry, perhaps the greatest was his discovery of a practical method of rendering concrete waterproof. He was also very instrumental in making white cement practical from a commercial standpoint, and his firm was one of the earliest producers of waterproofed cements.

Dr. Newberry is survived by a widow and two sons, Messrs. Andrew W. and Arthur C. It is announced that no changes in the personnel, management or policies of The Sandusky Cement Company are to be made for the present.

Widely Diversified Line of Concrete Products Produced by the Art Concrete Works

Practically all the different articles comprising the line of concrete products are turned out at this plant, including cement pipe, land markers, catch basin covers, hydrant boxes, water meter boxes, park benches, lighting standards, and all the numerous varieties of ornamental cases and garden furniture.

The business was established in Pasadena in 1910, by Mr. Leo G. Haase, who was one of the pioneers in the concrete specialty industry, commencing manufacture of various articles in a suburb of Chicago in 1885. A principle rigidly adhered to in this plant is that "no second rate material shall ever leave this yard."

Concrete water meter boxes were first intended for use only in Pasadena and nearby towns but Mr. F. M. Brooks, the present secretary and manager, who joined the organization in 1913, believed that it was possible to ship the boxes to other points and through his efforts a market was found in 265 cities and towns from New Mexico to the Canadian Border; in fact, anywhere on the Pacific Coast where the climate is suitable for water pipes to be placed near the surface.

Interior View of Workshop, Art Concrete Works, Pasadena, Calif. Note the Many Different Kinds of Products Being Turned Out.

The California bench is another specialty of this plant, being made on a very simple machine. This bench has become extremely popular in Western cities and has been introduced in the East. Special machinery and moulds were designed for the various patented specialties and the sale of such equipment now forms an important branch of the company's business.

The plant itself occupies over an acre in the industrial section of Pasadena and is located on the main thoroughfare between Pasadena and Los Angeles. To obtain the full advertising value of such a location, care has been taken to design attractive buildings and to provide an artistic setting for the samples of gardenware and other ornamental pieces. One of the patented specialties adapted for quantity production is a sectional incinerator or rubbish burner. It is built up in two, three or four tiers of slabs keyed or hinged at the corner by steel rods. This incinerator may be shipped knocked down, and is readily assembled, and for this reason it is saleable in all localities where it is necessary for the household to burn or dispose of rubbish.

Machine Used for Making Concrete Endpieces of the "California Bench."

The experience of the company has proved the importance of quality in the manufacture of concrete products. In designing, sharp corners are avoided, every corner and edge being rounded or beveled if possible. In both commercial and ornamental lines only one-to-three concrete is used. The materials are properly graded.

In developing the finest textures not only for gardenware but for the art stone trim so essential in present architectural design, white cement plays a very important part. While Eastern concrete products plants have a wide assortment of suitable crushed aggregate, some of which cannot be duplicated upon the Pacific Coast, there are available in the West some fine materials peculiar to its mountains, among them a beautiful black granite not found in the East.

Improving Concrete Products

National Lime Association, 918 G. Street, N. W., Washington, D. C., among many other booklets of interest to the builder and contractor, issues bulletin No. 302 entitled "Improving Concrete Products." This booklet is particularly interesting to manufacturers of concrete products. It contains valuable suggestions and recommendations for concrete mixtures. A copy of this booklet and any other published by the association that may be desired will be sent free upon request.

Danville, Ill., Builds Highway Bridge as Memorial to Citizens Who Served In World War

Structure of steel and concrete—Statue by Lorado Taft to be placed at one end

The city of Danville, Ill., has adopted a practical way of expressing its appreciation of the service rendered by its sons during the late war, in the construction of a Memorial Bridge on the recently completed concrete road that runs between Chicago and St. Louis.

This structure is composed of concrete reinforced with steel. Approximately 14,000 tons of concrete was used and 300 tons of reinforcing steel.

The over-all length of this bridge is 1,170 ft. and it is made up of six arches, the shortest span being 105 ft. and the longest span being 198 ft.

In addition to the steel and concrete that permanently entered this structure, there was one-quarter of a million board feet of lumber used in the falsework and concrete forms.

The contract for this bridge was awarded to Yeager & Sons, of Danville, Ill., in October, 1920, and it also included the wrecking of the old bridge that the new one replaced. By the middle of December of that year the concrete mixing plant, cableway towers and sawmill were erected and ready for operation. Concreting began on the 22nd of March, 1921, and was finished the 2nd day of November, 1921.

As it was desirable to maintain traffic on the old bridge until after the holidays, no work was started on the wrecking until the first week of January, 1921. The wrecking of the old bridge was accomplished by dynamiting and cutting with acetylene torches, and the work was completed in four weeks.

In giving us a description of this work, Yeager & Sons wrote in part as follows: "Wire Rope on this job certainly played an important part in its construction. The salvage from the old bridge, parts of the excavation, tearing out and placing of forms, and distribution and placing of the concrete was carried on with the cable. All the sand and gravel came in on a spur switch at the site and was unloaded by derricks and clam-shell buckets. The concrete was carried from the Boss mixer made by the American Cement Machine Co., Keokuk, Ia., by cableway in 1⅓-yd. batches, deposited in receiving hoppers and then placed by gravity."

At one end of this bridge a plaza is being constructed in which will be placed a memorial statue by Lorado Taft.

Eliminating Waste In Blasting

A new book just off the press that will interest all our readers who buy or use explosives is being mailed, gratis, by the Hercules Powder Company. It tells how some progressive companies are preventing waste in blasting; and it also contains recommendations of their own.

There are chapters on Planning the Work; Drilling; Choice of Explosives; Advantages of No. 8 Blasting Caps; Use of Stemming; Preventing Waste in Firing.

The report on Waste in Industry made by a committee of engineers appointed by Herbert Hoover, and published by the Federated Engineering Societies, pointed out the opportunities and necessity for preventing Waste in Industry. In this book, which the Hercules Powder Company plan to supplement with bulletins from time to time, they endeavor to give users of explosives the benefit of information they have gathered on the best methods for reducing blasting costs.

Anyone who desires this 56 page book, illustrated with photographs and diagrams, can obtain a free copy upon request to the advertising department, Hercules Powder Co., Wilmington, Delaware.

Notes On Good Stucco

It is always advisable to use Meduso Waterproofing in the last or finishing coat of Stucco. The waterproofing of this coat assures its durability and eliminates the possibility of absorption of water, carrying soot or dirt that would discolor the wall.

The standard specifications of The American Concrete Institute is approved by The Associated Metal Lath Manufacturers and The Portland Cement Association.

The following explanatory notes on Stucco should be observed in order that best results may be secured:

Successful stucco work depends in a large measure upon suitable design of the structure for stucco. Exterior plaster of any kind merits whatever protection can legitimately be given it, and while concession must sometimes be made to architectural requirements, there is rarely any necessity of subjecting stucco to an exposure which it can not reasonably be expected to withstand. Even where stucco will remain structurally sound, it is sometimes wiser to use other treatment for the sake of appearance. For example, it is better not to run stucco to grade not only because of the danger from frost action, but also to avoid staining the stucco with dirt and moisture. For the same reason special attention should be given to details of flashing and drips; wherein a little foresight will prevent much unsightly discoloration, and possibly more serious defects.

A fundamental rule in the design of a stucco structure is: "Keep water from getting behind the stucco." The architect should even go further than this and endeavor to keep any concentration of water flow from getting at the stucco at all.

Good bracing of the frame is important to secure the necessary rigidity. Bridging between the studs at least once in each story height is recommended whether the frame is to be sheathed or not.

The committee feels that fire protection is an important feature of this type of structure, and that some form of fire stop is necessary to develop its full fire resistive value. Probably the best method is to form a basket of metal lath to occupy the spaces between the studs at the juncture of the floor joists and wall. This should be filled with cement mortar or concrete from the ceiling level to 4 inches above the floor level.

A preliminary report from the Underwriters' Laboratories on back-plastered metal lath and stucco construction with Portland cement indicates that "this finish can be expected to furnish a substantial barrier to the passage of flame into the hollow spaces back of it, and to provide sufficient heat insulation to prevent the ignition of the wooden supports to which it is attached for about one hour when exposed to fire of the degree of severity to which stucco finished buildings are likely to be subjected under average exterior fire exposures."

Metal Lath should be specified by weight rather than by gauge, and should always be painted. Armco Ingot Iron or Galvanized Lath is a good investment and is to be recommended in preference to painted lath, unless the method of applying the stucco is such as to insure complete embodiment of the metal, as, for example, in the back-plastered type of construction.

Tests now available prove conclusively that a back-plastered house insulated as specified is warmer than a sheathed house.

Ordinary building paper applied in double layer is recommended as a satisfactory insulating medium.

In this connection reference may be made to a series of tests conducted in 1919 at the Armour Institute of Technology, Chicago, to determine the relative heat conductivity of various types of walls. These tests indicated that by the use of building paper or quilting, the loss of heat through a stucco wall of the back-plastered type was less, under standardized conditions, than the loss through the ordinary wood frame wall, covered with sheathing.

Hydrated lime should be specified to the exclusion of lump lime, chiefly for the reason that lime which is slaked on the job cannot as a rule be so thoroughly hydrated and so thoroughly mixed in the mortar as the mechanically hydrated product.

Curing of the undercoats by sprinkling, and protection of finish coats against the sun, wind, rain and frost by means of tarpaulins are always to be recommended. This is not always feasible, however, and the architect should be content to specify and insist upon reasonable precautions.

Whereas the interval between the brown coat and scratch coat, as recommended above, is relatively short, the interval before applying the finish coat should be as long as permissible under the conditions of the work. The reason for thus delaying the application of the finish is to enable the body of the stucco to obtain its initial shrinkage and a nearer approach to its final condition of strength and hardness, before being covered with the surface coat. A week or more

should elapse between the application of the brown and finish coats.

The finish coat should be applied over a damp, but not saturated, undercoat, for excess water is likely to injure the bond seriously. Certain types of finish such as the wet mixtures used for sand spraying or for the "splatter dash" finish, may preferably be applied to a fairly dry undercoat, since suction must be depended upon to prevent streakiness and muddy appearance. The fact that finishes of this type applied in this manner may set and dry out with little strength is not serious. They gradually attain sufficient hardness with exposures to the weather.

The possibility of defects resulting from the expansion and contraction of rich mortars should be referred to. The chance of such defects occurring must be greatest in the finish coat, which is directly exposed to the extremes of moisture and temperature variations. The hope of overcoming these defects lies mainly in the use of leaner mixtures, in which the tendency to movement is cut down as the proportion of cement is reduced. The problem therefore is to use less cement and at the same time retain the necessary density by improved gradation of the aggregates.

All that may be accomplished in this direction, however, will hardly permit a smooth troweled finish to be used. This treatment produces a concentration of fine material at the surface, which will almost inevitably develop fine cracks. In the course of time these cracks will collect soot and dirt, and become conspicuous and unsightly. At best the smooth troweled finish is not to be recommended, and specifications should eliminate all reference to it.

The dash finishes—such as the sand spray, which is obtained by applying a mixture of sand, cement and water with a whisk broom or long fiber brush, to the splatter dash, which is usually a thin mortar containing coarse sand or stone screenings thrown from a paddle, or the rough-cast, which is a mixture of pebbles and cement grout thrown from a paddle or the back of a trowel—are all relatively rich in cement and all develop fine cracks to a very marked degree, but the rough texture of the surfaces masks these defects, and the type is therefore generally satisfactory and very widely used.

The chief objection to the dash finishes as above described is their rather cold, unbroken cement color, which may be relieved and improved to a considerable extent by the judicious use of mineral pigments. Another means of varying the monotony of the natural grays and whites of the cement is by use of the dry dash finishes in which clean pebbles or stone chips are thrown against the fresh mortar of the finishing coat while it is still soft. When the dry dash is well selected, and the particles thickly and uniformly distributed over the surface, the finish thus obtained is pleasing and possesses decidedly more life and character than the wet dashes.

The sand-float finish deserves special consideration because it promises to be one of the most satisfactory finishes of the future. Due to the use of rich mixtures the sand-float finish has usually developed defects similar to those experienced with the smooth troweled finishes, differing from the latter only in degree. Sand-floated stuccoes which have been covered with paint are to be found in every community, and this alone is sufficient evidence of unskilful manipulation of this finish and of the unsatisfactory results that have been obtained. In the experiments carried out at the Bureau of Standards, the sand-float finish was found to be most satisfactory on mixtures containing not more than 1 part of Portland cement to 4 parts of fine aggregate, and mixtures as rich as 1:3, with a small addition of hydrated lime, were satisfactory as a rule only when the final floating was delayed until the mortar had well stiffened. In this manner the concentration of fine material in the surface was prevented.

Too Much Water Weakens Concrete

Do you know that the slump test is the simplest and most practical way of determining the proper amount of water to use in mixing concrete?

The correct cement-water ratio for any concrete mixture will develop the maximum strength of the concrete. A knowledge of how to determine this ratio is a matter of importance to the builder.

The slump test is a simple, easy, and practical method of making this determination. The only apparatus necessary is a specila mold, made from sheet metal, preferably non-corrosive, in the form of a frustum of a cone 4 inches in diameter at the top, 8 inches in diameter at the bottom, and 12 inches in vertical height.

After thorough mixing the concrete is placed in the mold in three or four successive layers, each layer carefully puddled or rammed with a blunt-pointed 5/8-inch round rod. The metal mold is then removed with a steady, vertical lift, leaving the concrete free to spread at the base. The "slump," or reduction in vertical height of the pile of concrete which results, is an indication of the consistency of hte mixture.

The consistency which produces concrete of maximum strength is known as a "normal" mixture, and has a slump of about one inch. A reduction in the amount of water of 10 per cent below that required for a normal mixture will change the slump to only one-half inch, and *decreases the strength of the concrete about 30 per cent.* Increasing the water 10 per cent above normal will result in a slump of almost three inches, and *a loss of at least 15 per cent in strength.*

A portion of the strength of the concrete must sometimes be sacrificed in order to obtain the plasticity of mixture required by the manufacturing processes employed. For pavements, floors and large foundations, the slump should not exceed 3 inches. For thin, reinforced concrete walls where smoothness is required but compacting is difficult, a mixture with a slump of 6 or 7 inches is permissible because its wet consistency practically eliminates the necessity of tamping. *Remember: Do not make your mixture more plastic than is required by the nature of your work.*

Next Year's Catalogue

The Anderson Foundry & Machine Company, Anderson, Indiana, has already published its 1923 catalogue on the Anderson oil engine, which is known as General Catalogue No. 12.

A most interesting feature of this catalogue is the comparative power cost chart showing graphically all the details of power cost on seven different types of power equipment. It is a most interesting study to anyone who has to do with power installation.

The catalogue itself is fully illustrated with halftones of the various types of engines made by this company, typical installation, etc. It is entirely free on application to the company.

Eighteen Stories of Concrete

Hide and Leather Building, the Tallest Concrete Building in the United States, by Walter D. Binger, Ass.M.AM.Soc.C.E., Vice-President, Thompson & Binger, Inc., New York City.

It has often been stated that reinforced concrete as a type of construction, would never be suitable for buildings of great height. That height need not be a limiting factor has been demonstrated in the Hide and Leather Building recently completed by our organization.

Hardly secondary in interest and importance is the fact that, in spite of the record-breaking height of the building, the work was carried on successfully through the winter months. While precautions and necessary refinements in methods were observed in the winter work, the construction of this building has proven that even for unusually high structures, cold weather work is commercial success.

Columns and Curtain-Walls

Perhaps the principal objection advanced against reinforced concrete for high buildings is that columns of the lower floors would need to be uneconomically large. This objection was overcome by the use of a rich mixture (1:1½:3) for columns, together with the use of specially high strength spiral hooping. The concrete was mixed in a 1-yd. steam driven Boss mixer of the batch type, made by American Cement Machine Co., Keokuk, Iowa.

The use of brick and tile curtain walls has always been popular for reinforced concrete buildings—sometimes because of building code requirements which impose the same wall-thickness for concrete as for brick or tile. In this building, advantage was taken of the rule that in New York City 8-in. concrete walls are allowed as equivalent of 12-in. brick—a considerable saving in a building of this size.

Flat slab design and the use of steel forms for columns and floor slabs, resulted in smooth, even concrete surfaces, thus contributing much to the light, sanitary and clean-cut appearance of the interior of the building.

Concrete Surface Finish

For a concrete building of such height and prominence it was realized that a distinctive and beautiful surface finish was a necessity. In order to preserve unity of treatment in the finish, it was decided to obtain the desired effect in the concrete itself by tooling a specially prepared facing mixture of the walls of the two lower stories.

The concrete of the structural part of walls, columns and floors was made with gray Atlas Portland cement and the regulation commercial aggregates. The facing mixture was composed of Atlas-White Portland cement and colored aggregate consisting of rose quartz and feldspar chips, mixed one part cement and two parts of aggregate.

There has always existed a difficulty in placing conveniently and economically a facing mixture of concrete monolithically with the balance of the backing concrete. The commonly accepted method has been the use of facing boards—a troublesome, costly and sometimes only partially successful expedient.

In the placing of the facing mixture on this building, a much more convenient and practical method was employed. In place of a movable facing board, metal lath was wired to the outer reinforcing bars, leaving a space of 1½ to 2 inches between it and the outer forms. This space, usually filled with ordinary concrete as fireproofing, was used for the facing mixture.

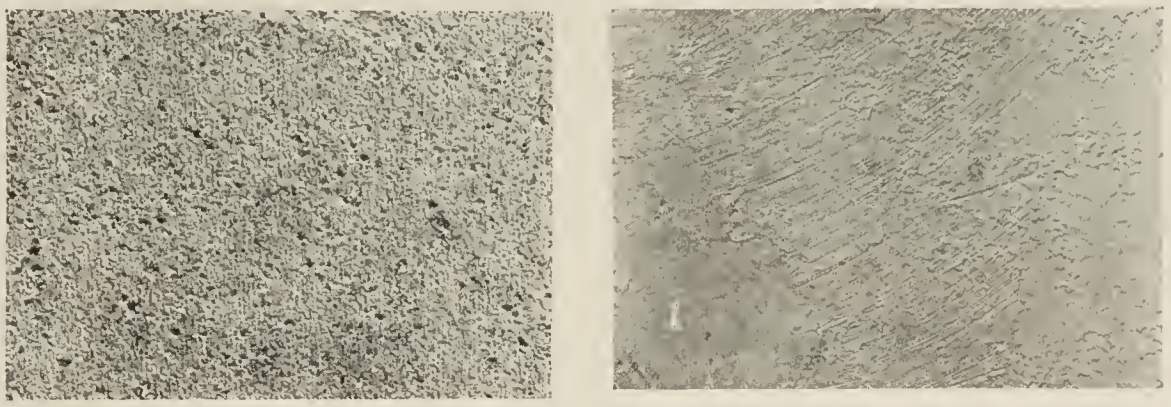
By keeping the level of the facing concrete higher than the backing concrete, no difficulty was experienced in securing a continuous face showing none of the backing. Careful tamping of the facing mixture was accomplished by means of ½-inch bars with T-heads.

Any slight defects in the surface were pointed up after the forms were removed. The concrete was then allowed to cure all through the winter before the tooling was done. This consisted of bush hammering to expose the aggregate. The resulting surface is a strikingly exact reproduction of natural granite.

The upper stories were surfaced by grinding with carborundum. Coating with a colorless waterproofing fluid will preserve the even, pleasing color of the surface.

It is to be hoped that the Hide and Leather Building will have its part in demonstrating to layman, architect, and engineer, the possibilities of reinforced concrete for high buildings and buildings of attractive appearance.

Jacks Used for Forcing Down "Pre-test" Concrete Piles to Equal Loading.



Concrete surfaces before and after brush-hammering to expose special aggregates.

Micarta Gears Booklet

In order to acquaint the industrial gear user with the advantages of Micarta eGars, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a 20 page booklet, Folder 4506, entitled "Salient Facts on Silent Gears." The booklet describes the advantages of the use of Micarta gears and pinions and gives photographs and data describing some of their applications, tables of gear data, etc., enabling the gear user to judge whether or not they are applicable to his machinery.

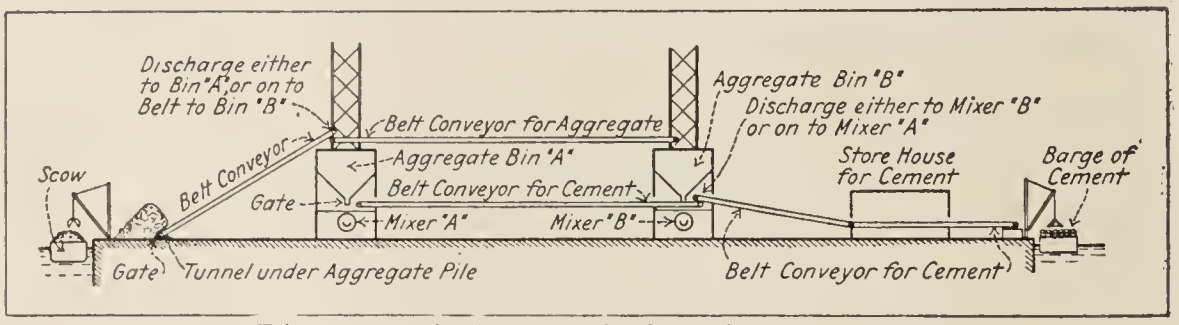
Convenient Plant Layout for Constructing Large Elevator

Continuous concreting makes careful plant layout a necessity, by C. R. Conkey, Chief Engineer, Fegles Construction Company, Ltd., Minneapolis, Minn.

Continuous night-and-day concreting for 13 days required very careful planning of the concreting plant for the New York State Barge Canal Terminal Elevator, New York Harbor. The continuous moving or slip type of form used for this work required that once the concreting was started there could be no interruptions until the walls were complete.

In order to secure most convenient distribution of mixed concrete and maximum flexibility, two mixing plants were established, each equipped with a one-yard steam driven Boss batch mixer, manufactured by American Cement Machine Co., Keokuk, Iowa. The use of two independent plants and towers was insurance against stoppage of concrete from the temporary breakdown of one of the plants.

Above—Forms Ready for Pouring. Note Jack-rods Extending Up Through Jacks, Also Working Platforms and Small Concrete Distributing Hoppers.



Diagrammatic layout of plant (*not to scale*)

The mixing plants consist of elevated storage bins with the mixer placed beneath, so that the aggregate drops directly from the bin to the mixer hopper. At the hopper level is a working platform for the mixer operator, and for the handling of the cement.

The aggregate consists of sand and gravel already mixed in the right proportions, and is delivered to the job by boats. From these it is unloaded by a derrick and a clamshell bucket into a large pile, which is placed above the tunnel. From this tunnel runs a belt conveyor which passes over the top of both the aggregate bins and has sufficient capacity to keep both filled, and by the use of chutes the material is fed first in one and then in the other. A gate in the tunnel at the aggregate pile controls the movement of material at this point. The Atlas cement for the work is also delivered by boats at the other end of the job and is unloaded by derricks using a platform. This platform lands the cement alongside a belt conveyor which runs through a long cement storage warehouse and from there to the working platforms of the mixing plants. By this method when the job is in operation the cement is handled directly from the boats to the mixer platforms. At other times the cement is taken off the conveyors in the warehouse and kept as a reserve supply, which is used during the interval between the unloading of boats. This arrangement is best shown in the diagram heading this article.

At the mixing plants small proportioning hoppers were provided for aggregate and cement. The cement bags were emptied into the cement hoppers so that the mixer could be charged with aggregate and cement without loss of time. Rapid charging and discharging allowed an output of one yard a minute and still gave an adequate mixing period. From the steel concreting towers the mixed concrete was discharged through bifurcated spouts to small supply hoppers holding about one or one and one-half cubic yards. From these supply hoppers buggies were filled and wheeled to point of depositing. This system of distribution by buggy, worked out very successfully, as would be expected from the necessity for relatively small volumes of concrete widely distributed.

View of Massive Columns Supporting Bins. Rectangular Columns are Exterior Columns, While Round Columns are One of the Rows of Interior Columns.

The mixing plants turned out on an average 1,000 cubic yards of concrete per 24-hour day, and allowed the 95 feet of wall to be finished in 13 days.

Slip Forms

Wood forms were used 4 feet in height. As the illustrations indicate, these forms are made with vertical one-inch sheathing boards and laminated wood

horizontal circumferential bands. The steel jacks for continuously lifting the forms are a type developed by the Fegles Construction Company and consist essentially of a structural steel frame equipped with a threaded jack-screw, threaded nut and tool-steel jaw clutch. One inch vertical jack rods are embedded in the concrete, the jaw clutch at the bottom of the screw exerting a tremendous grip on these rods. Turning of the jack-nut by means of a long bar raises the entire jack and form, the weight being taken by the one-inch jack rods. There are 8 jacks for each bin.

During the pouring of the concrete for the walls these jacks are operated practically continuous, workmen going constantly from one jack to another and raising the forms slightly. A transit is set up to constantly give levels on the jack rods, so that all forms go up evenly and each jack be operated the same amount. From the wall forms is suspended a hanging scaffold on which the finishers work. The finishing consists of floating the wall surface with wood float and the scaffold is so located that the finishers can work on the concrete wall as soon as it is uncovered by the rising forms, so that the finishing can be done 8 or 10 hours after the concrete is placed.

Photograph of Bins at Completion of Wallpouring. This View Shows the Water Side of the Elevator.

Details of Elevator Structure

The main elevator building is 69 ft. 4 in. wide by 429 ft. 4 in. long. It comprises fifty-four 20-ft. diameter bins 95 ft. high, with the additional interspace and outerspace bins. The total capacity will be about two million bushels. The bins are elevated on 216 concrete columns, which allows plenty of space beneath the bins for housing the necessary conveying and other machinery. The tank walls have a uniform thickness of 8 inches and are reinforced with steel lap-bands at a uniform spacing of 12 inches. The cross-sectional area of lap-bands is varied to meet the varying pressures. The mixture for the bin walls is the equivalent of 1 part cement to 1.6 parts sand to 3.2 parts of pebbles, although as stated before, the fine and coarse aggregate came to the job pre-mixed in the proper proportions. The entire structure is carried on wood piles covered by a reinforced concrete mattress 2-ft. 6 in. thick. The interior columns are spirally reinforced circular columns 42 in. in diameter with a 7

Slip Forms Being Set Up on Bin Floor. Note Jacks for Raising Forms.

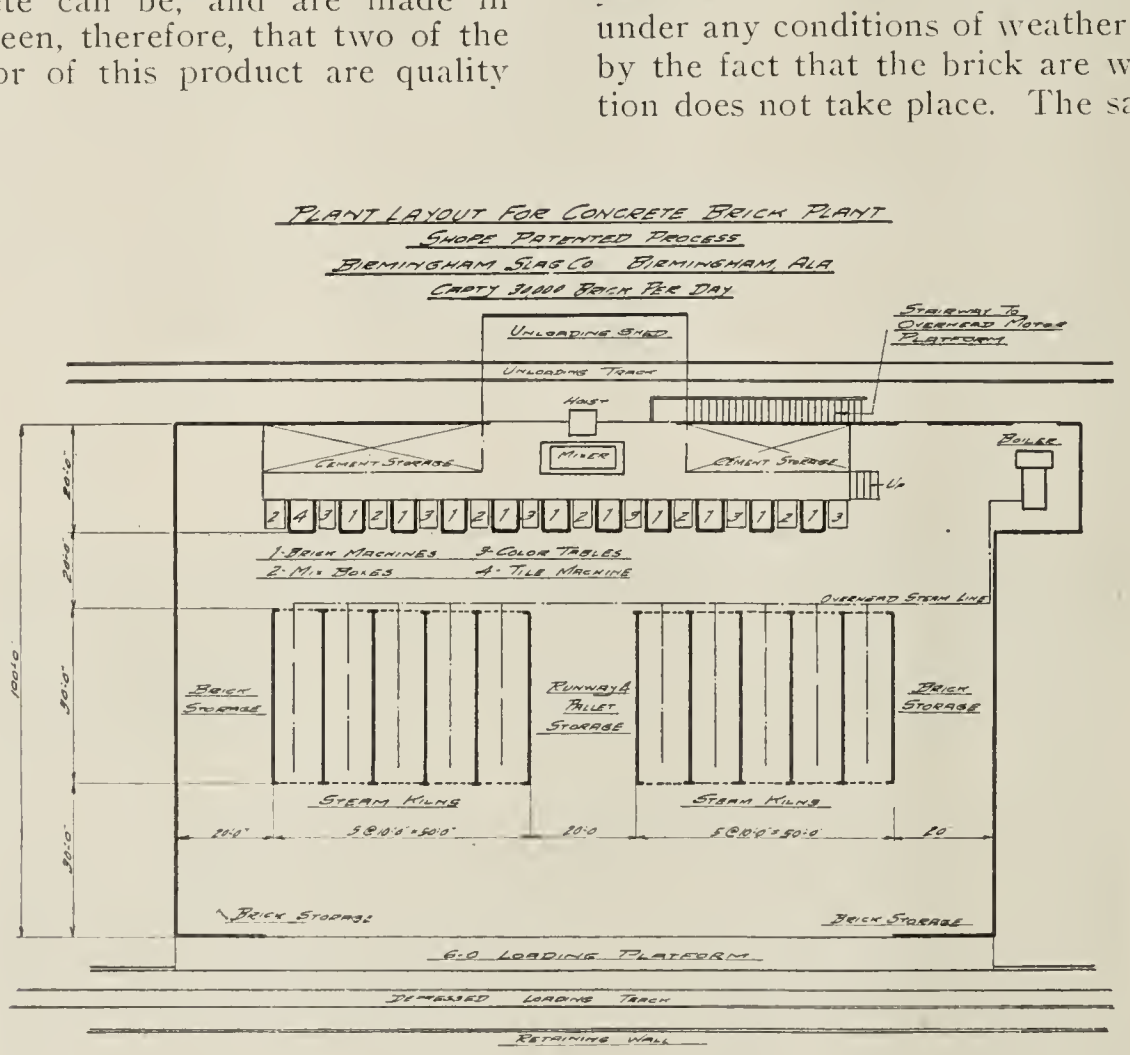
ft. flare head and a 7 ft. x 9 ft. plinth on top. The exterior columns are rectangular in cross-section, 30 inches x 60 inches, with flare head. The floor slab of the bins supported on the columns is 14 inches thick, reinforced. Steel conical hopper bottoms extend through holes in the floor slab as shown in illustration. The bins will be surmounted with the usual structural steel cupolas for housing conveying machinery, scales, etc.

When this elevator is completed, it will form an important link in the canal system of New York State, because it will form a distributing center for grain brought by barges through the State Barge Canal.

Concrete Brick: Its Manufacture and Use

In the past few years, concrete brick has gradually come to be recognized on a quality basis. The numerous outstanding advantages which brick of this type have, so far overshadow the ordinary clay brick, that those who want quality above all other considerations, are turning to concrete. Concrete brick, too, can in most cases meet the price of common brick (clay), and can undershoot the prices of similar face brick. The facings in concrete can be, and are made in greater variety. It is seen, therefore, that two of the best arguments in favor of this product are quality and economy.

Interior of Plant. Brick Machines at Left and Pallets at Right.



One might well ask, "What is quality in brick?"

Quality is Beauty. There is practically no color or color tone that cannot be reproduced. The architect can plan his color schemes without worry as to whether building brick can be obtained to reproduce his artistic ideas—they can. Any texture is obtainable and with the exercise of a little imagination the beautiful variety of effects can readily be visualized.

Texture is Beauty. Smooth, glistening white; tapestry effects; soft, Oriental color tones; the moss, the dull, the rough—all are included and all are at the disposal of those who would have and use them.

Uniformity is Beauty. Brick of a pattern are as alike as brother peas in a pod. There are none that are off color to creep into a wall, and glaringly mar the effect that is desired. Every brick is perfect in size, color and strength.

Durability is Beauty. The bricks are made of cement concrete. The strength increases from year to year—deterioration does not take place. A dry wall under any conditions of weather and season is assured by the fact that the brick are waterproof. Discoloration does not take place. The same pleasing tone that was first selected remains year after year, unmarred by efflorescence.

From a manufacturing standpoint, also, concrete brick has many advantages. In these days, Portland cement can be obtained anywhere. For aggregate, sand, sand and gravel, crushed slag screenings, or crushed stone screenings are used. There is almost no section of the country where some one, at least, of these forms of aggregate cannot be obtained easily and cheaply. All that remains is to select the most desirable distributing point.

The diagram and pictures which accompany this article are of a plant installed for the Birmingham Slag Company by the Shope Brick Co., Portland,

Oregon. The use of modern steam curing of concrete products eliminates the expense, in time and money, of carrying excessively large stocks, which in turn reduces to a minimum the ground area required by a manufacturing plant.

The plant illustrated covers a ground space of 116 feet by 160 feet, has an output of 30,000 brick per day, and requires the services of 18 men.

There is an elevated unloading track, from which the materials are dumped directly into a storage pit, where they are measured. From the pit they are hoisted and automatically dumped into the Kent continuous mixer. From the mixer, the materials are chuted to five mix boxes, supplying ten brick machines. The machines mould and finish the brick on pallets, which hold ten brick apiece. One off-bearer, by use of a Pneumatic truck, removes the green brick to the steam rooms, where, after 24 hours of curing they are ready for shipment or storage.

The depressed loading track, shown in the sketch,

Exterior of Plant—Conveniently Located on Railroad Siding for Direct Loading Into Cars.

makes a saving of at least 50 cents a thousand in loading cost. This track is seen in the photograph of the exterior of the plant.

The ten steam curing rooms are made in two sections of five each. Each room is ten feet wide and thirty feet long. The total capacity of both batteries of rooms is 60,000 brick every 24 hours. Electric power is used entirely to drive the mixer, hoists and sack cleaner. Incidentally, it might be mentioned that the sack cleaner reclaims from 4 to 6 barrels of cement a month. A small upright boiler carrying 20 pounds of pressure supplies the steam for the curing rooms.

The Birmingham Slag Company use their No. 7 size (¼ inch to dust) Ensley blast furnace slag in the manufacture of their new product, which they have appropriately named "Slagtex." Their No. 9 slag sand is used in the manufacture of floor and hearth tile under the Shope process. The plant is installed and equipped so that by an additional expenditure of $3,000.00 and the employment of 16 more men, the capacity of the plant can be doubled, giving a capacity of 60,000 brick per day.

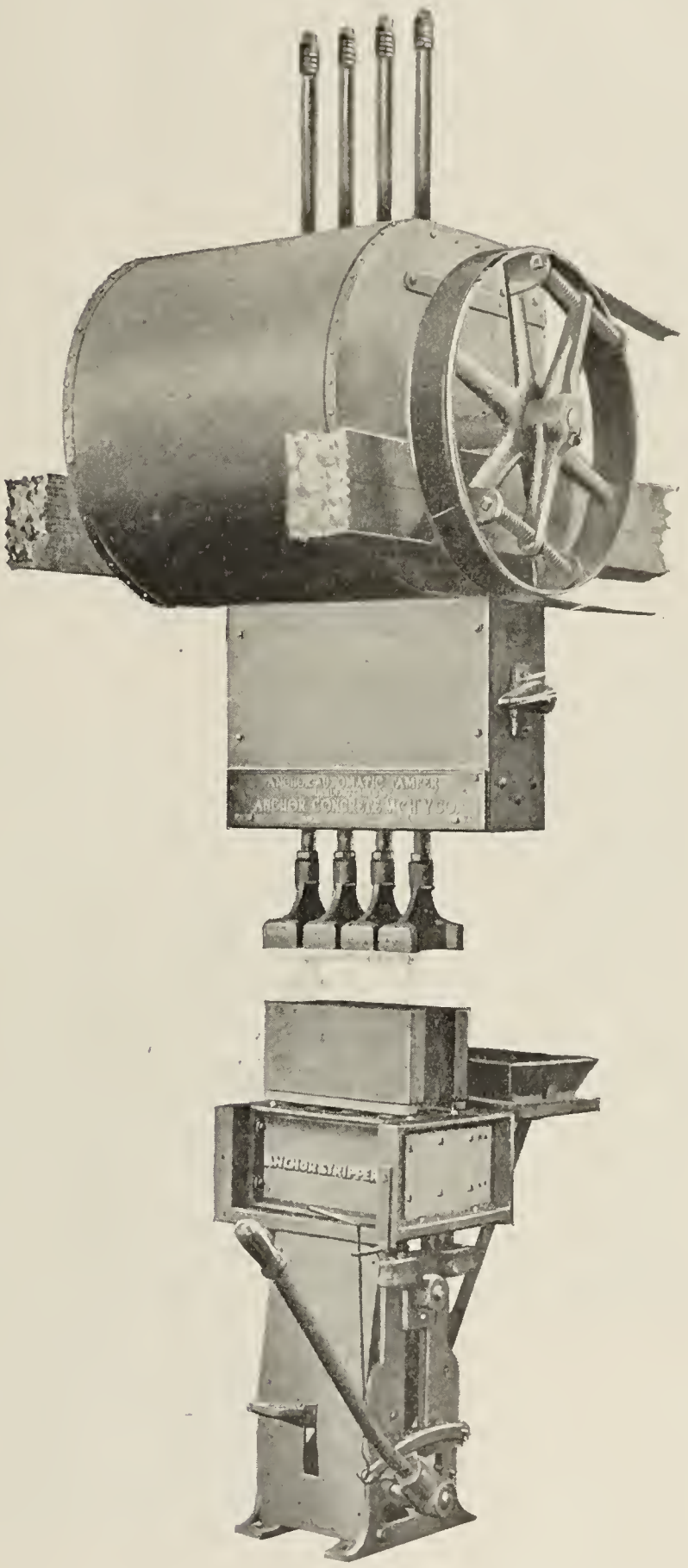
Gravel Excavators

Sauerman Bros., 1139 Monadnock Bldg., Chicago, have published an 18-page illustrated pamphlet on handling sand and gravel with dragline cableway excavators which dig, elevate, convey and dump material without the use of intermediate machinery. The scraper buckets are made in six sizes, from one-third to 2 cu. yds., and the maximum economical cable span is 800 ft. Photographs and text cover a wide variety of installations of this type.

The Anchor Stripper

Every day sees a greater demand for plain faced blocks. The best and fastest way to make such blocks is on a stripper machine. This process permits the use of an extremely wet mixture. All the concrete receives a direct blow from the tamper for the tamp feet completely cover the block.

Then to complete this combination of desirable condi-



tions, the block is stripped out of the mold box. This stripping action is not only the fastest known means of delivering a block but is also the best. Every face is trowelled perfectly.

You will find on the stripper shown herewith (made by the Anchor Concrete Machinery Co., 536 Dublin Ave., Columbus, Ohio) the same high grade material and workmanship which has made the HOBBS block machine and the ANCHOR TAMPER so well known. All parts are accurately machined in jigs. The mold box is bolted rigidly together insuring an absolutely true

block at all times. This is not a cheap machine made to sell to the small "back yard" plants. It is very heavy and well built. It is simple, sturdy and low priced to conform to the Anchor System of big production at low cost and is used in some of the biggest plants in the country.

The machine is made in three sizes: 16, 20 and 24 inches. Each different length machine will make blocks any width of wall, such as the 8, 10 or 12 inches, by getting the necessary cores and pallets to conform with the size wall desired. The standard size cores furnish with the machine give 40% air space. In localities where building restrictions will not allow as great an air space as furnished with the machine, there can be furnished, when specified, a lesser percentage air space, such as 33% or any percentage of air space desired. The Anchor Company can furnish any other shape of core to match pallets you may have or desire.

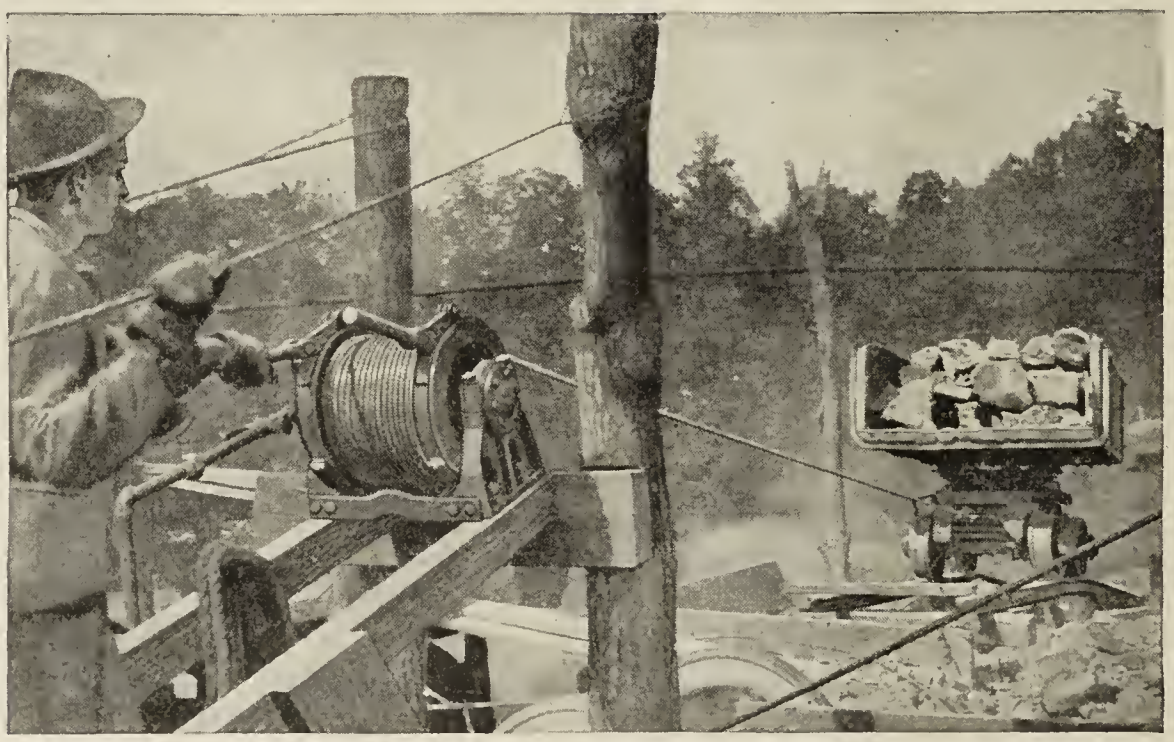
The Anchor Stripper makes a quality block. The Erie Cement Products Co., Sandusky, Ohio, writes as follows: "My Anchor Stripper is working fine and turning out the best plain block made in Erie County. Am having big sale for same and am well pleased with the machine." These blocks can be laid either face out. They are made wet—tamper hard—and will run way above tests required by any code.

Small Air Hoist Cuts Haulage Costs

During the past year, the town of Cooksville, Tennessee, completed the construction of a small hydro electric plant to light the town. In throwing a dam across a small stream near the town, a quarry was opened up to furnish stone, for concrete. It was necessary to haul a stone car up a narrow gauge track about 250 feet to the crusher. In order to handle this car quickly, and at low expense, a small portable compressed air hoist made by Sullivan Machinery Co., 418 Gas Bldg., Chicago, was installed. As will be noted from the accompanying illustration, the hoist was bolted on timbers inclined at a suitable angle and fastened to a couple of vertical posts at a sufficient height. The car weighed 1,200 lbs. empty and held three yards of stone. The grade was 30 degrees. Under these conditions, the hoist handled the heavy load rapidly and effectively.

The hoist weighs only 285 pounds but develops 6½ H.P. and has a rated maximum capacity of lifting one ton vertically at 110 feet per minute. The ordinary air pressure recommended is 75 pounds to the square inch.

The drum holds 500 feet of 5/16 inch wire rope. The engine of this hoist is of novel design, consisting of a pair of turbinair rotors, or helical gears, ground together and running in a tight casing on ball bearings. Advantage is thus taken of the expansive qualities of the air and the hoist is very economical in its air consumption. The motor revolves with the drum, which, in fact, forms the motor casing and which is driven by gearing. The hoist is controlled by a clutch and a friction brake.



Sullivan Portable Compressed Air Hoist.

A New Link-Belt General Catalog

A new general catalog, No. 400, is announced by the Link-Belt Company of Chicago, Philadelphia and Indianapolis. It embraces the entire line of products made in the plant as well as the products of the H. W. Caldwell & Son Company plant of the Link-Belt organization. It has 832 pages and is bound in cloth. A copy can be obtained by anyone interested from any branch office. Among the contents are chains and wheels, to which 220 pages are devoted, power-transmission machinery, boiler plant equipment, coal tipple equipment, sand and gravel washing equipment, lime handling equipment, elevators and conveyors, sugar plantation and refinery machinery, electric hoists, cranes, etc., besides many other products.

Automatic Dump Body

This type of body manufactured by the Mandt Co., Keokuk, Iowa, is described in its recent folder and gives the dimensions of the 1-yd. 1½-yd. and 2-yd. heavy duty bodies put out by them. Also the automatic hopper type bodies built in 1½-yd. and 2-yd. capacities. The applications of these bodies are also explained.

The Link-Belt Crawler Type Crain

Our readers in various lines of industry will be interested in the following report of the accomplishments of the first Link-Belt Crawler Type Crane; a machine which is going to make full locomotive crane service available in places where there are no tracks, and under conditions under which a locomotive crane could not operate.

The first Link-Belt Crawler Crane has been in operation over five months, in the first half of which time it was operated day and night under particularly unfavorable circumstances. The job was out of the way in low swampy ground, removing the muck overburden, digging the sand, and building the sub grade for the last link of permanent pavement between the East and West, around the lower end of Lake Michigan, between Gary and Michigan City, Ind.

The kind of labor obtainable was not skilled in handling and caring for machinery, and the crane was overloaded most of the time. In spite of the handicaps, it excavated and placed on permanent roadbed, over 30,000 cubic yards of material; and when this work was completed it traveled under its own power to the nearest town and was loaded in record time on a flat car.

It was a revelation to the contractor to see the speed with which it could be loaded on a car. It took a few men twenty minutes to build an incline of loose railroad ties to the end of the car, and about five minutes for the crane to get squared around, straddle the railroad track, walk up the incline, and be placed in permanent position on the car.

They did not have to dismantle the upper and lower frames and jack them separately on the car—an operation which takes a number of men several days.

The incline at the bottom was about 20%, and at the top as much as 35%, but the crane had no difficulty in negotiating the grade. The engine had been running under full load for about 1,500 hours, without any mechanical adjustment or attention.

On its next job, at a sand pit, it loaded 40 yard capacity gondola cars heaping full in less than twenty minutes, although only equipped with a ¾-yard garb bucket. In the accompanying illustration the crane is shown stripping the overburden from the sand deposit. In some places the sand is so loose and dry that the whole caterpillar mechanism is entirely buried in sand, especially when the machine is turning.

The operator is very enthusiastic about the machine,

and said he had loaded 13 cars heaping full with sand (several being 70-ton capacity cars) in four hours and twenty-seven minutes. He claims he can load thirty cars in nine hours, and that he has the engine so nicely adjusted now that he is only using 11 gallons of gasoline in ten hours. All the operators who have handled this machine agree that they have never in all their experience had an easier job, as far as handling the operating levers is concerned.

The self-cleaning construction of the tread has made it possible to state that the machine has never been stuck, and it has been a number of times in places that would mire and stall other machines.

For switching cars with the crane they use a cable attached to the lower frame. They have pulled up a 1% grade as many as seven railroad cars at one time, loaded with sand, and they feel they could easily pull twice as many.

Construction of the North East Sewage Disposal Plant Philadelphia, Pa.

When a coating is needed for covering a concrete The plant layout for pouring the concrete of the North East Sewage Disposal plant, now being completed for the City of Philadelphia, by the Du Pont Engineering Co. of Wilmington, Del., has been designed for covering a large area of work in the most economical manner.

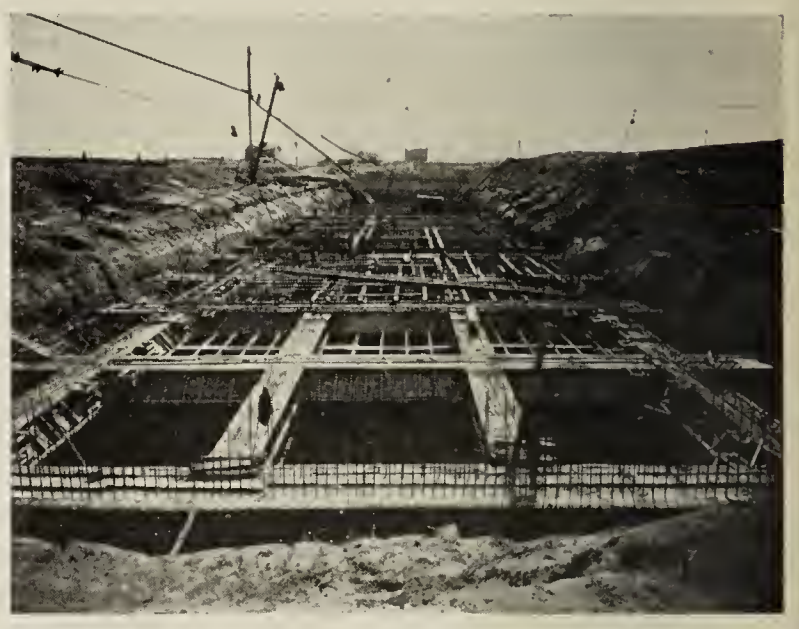
The sewage disposal plant consists of two central sedimentation tanks each 92 feet by 362 feet placed side by side. These tanks are flanked on each side by sludge drying beds each 184 feet, 8 inches by 362 feet, and are in turn flanked on each side by a sedimentation tank 92 feet by 362 feet, making a total of four sedimentation tanks and two sludge drying beds, necessitating a concrete plant to cover an area of about 400 by 800 feet. As the concrete, in all about 40,000 cubic yards, is to be poured in several lifts, the plant has to have sufficient flexibility so that delivery of concrete can be quickly shifted from one part of the work to another.

Physical conditions led to the placing of the mixing plant at the end of the two central sedimentation tanks and a short distance from them. Here the sand and gravel are delivered by small tip cars on a standard gauge track and cement is delivered by rail. The concrete is mixed in Boss mixers (manufactured by American Cement Machine Co., Keokuk, Ia.) elevated in two towers and distributed by chutes.

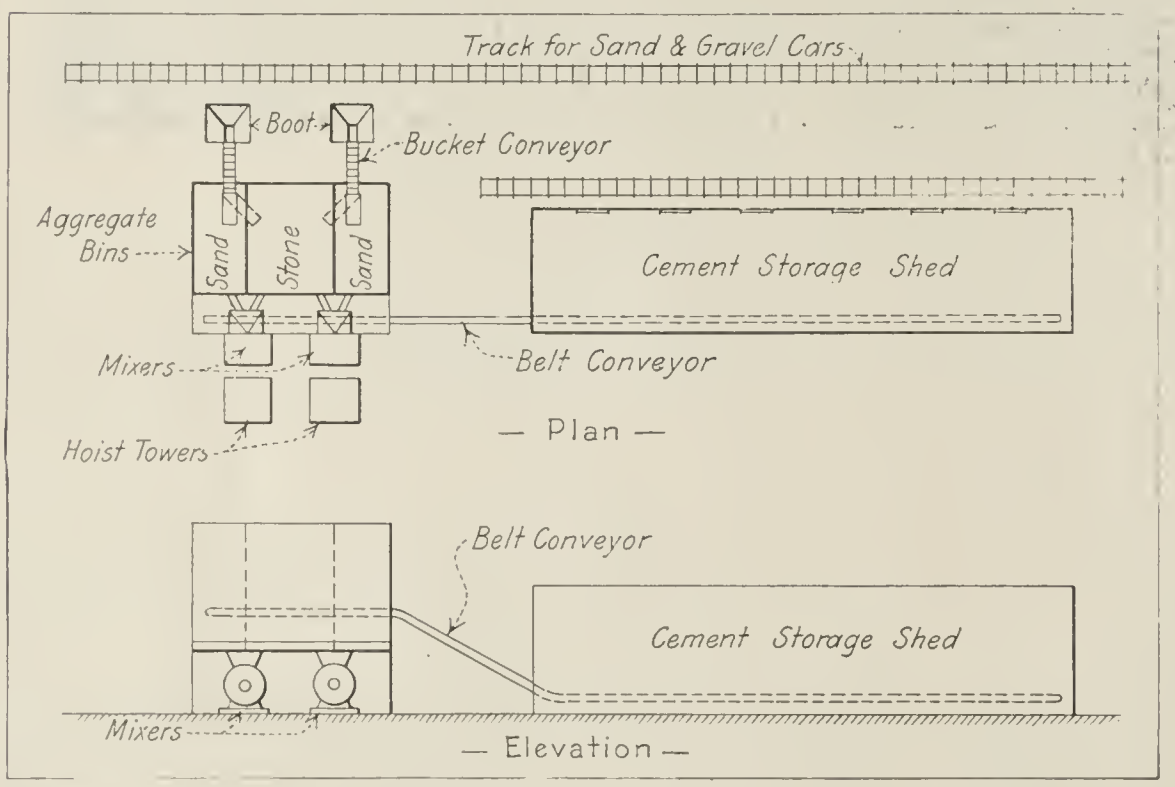
Stone in the form of gravel is received by barge at a dock nearby on the Delaware River. Here it is unloaded by a clam shell bucket from a stiff leg derrick into a hopper from which it is dumped into standard gauge dump cars. Excess gravel is piled on the dock so as not to hold the barges and reloaded as needed into the hopper. The sand is excavated from the site and loaded into the same kind of cars by a portable loader.

At the mixing plant is an elevated bin divided into three compartments as shown in Fig. 1. The central and largest bin is for stone and the smaller bins for sand. This bin is filled by two bucket conveyors, shown in Fig. 2 which elevate the material dumped by the cars into boots. These elevators run alternately on sand and stone

Construction of the North East Sewage Disposal Plant, Philadelphia, Pa.



Battery A Showing Form Work and End of Concreting Chute Which Brings Concrete From the Main Mixing Plant.



Layout of Concreting Plant Showing Cement Storage Shed and Aggregate Bins.

Roller Conveyor Used for Unloading Atlas Portland Cement From Car Into the Cement Warehouse. This Conveyor Was so Steeply Inclined That no Pallets Were Needed Under the Bags.

and by means of pivoted chutes at the top, discharge into the proper bin.

At the opposite side of the bin are two ¾-yard mixers of the non-tilting type. The charging hoppers for these mixers are fed by gates from the bins. As the sand and stone bins are kept well filled, no hand labor is involved.

Cement is received in cars which are unloaded into a long narrow shed as shown in Fig. 1. The cars are close to the doors in the shed and the cement is rolled in on conveyors without the use of pallets, by using a conveyor with very close rollers and at a sharp angle. Through the cement shed runs a belt conveyor which on leaving the shed rises on about a 45° slope to a point

Concreting Plant Showing Two Hoist Towers With Chute Distributing System. Note the Long Run of Chute From One Tower Over to Battery A.

over the mixers, thus delivering it immediately adjacent to the charging hoppers.

The two Boss mixers (made by American Cement Machine Co., Keokuk, Ia.) discharged into two buckets run in adjacent towers as shown in Fig. 3. Both buckets are raised by the same double drum steam hoist. The shorter tower is 180 feet high and the other 200 feet. From these towers the concrete is distributed in chutes.

In the westerly sedimentation tank section and at the central sedimentation tanks, derricks have been erected. To the tops of the derrick masts the chutes are run, supported on cables, and at the points are remixing hoppers. Suspended from the booms of the derricks are counterweighted chutes, thus allowing a large flexibility in their position and consequent point of delivery.

While the chutes are on a comparatively flat slope little trouble has been experienced from failure of the concrete to flow. This is attributed to well graded aggregates, the use of hydrated lime and a thorough mixing with the amount of water held down to a minimum, thus producing a homogeneous concrete and one with but little tendency or the coarse aggregate to separate from the mix.

Mr. Harry B. Eaton is the engineer in charge and Mr. D. M. McLean the construction superintendent.

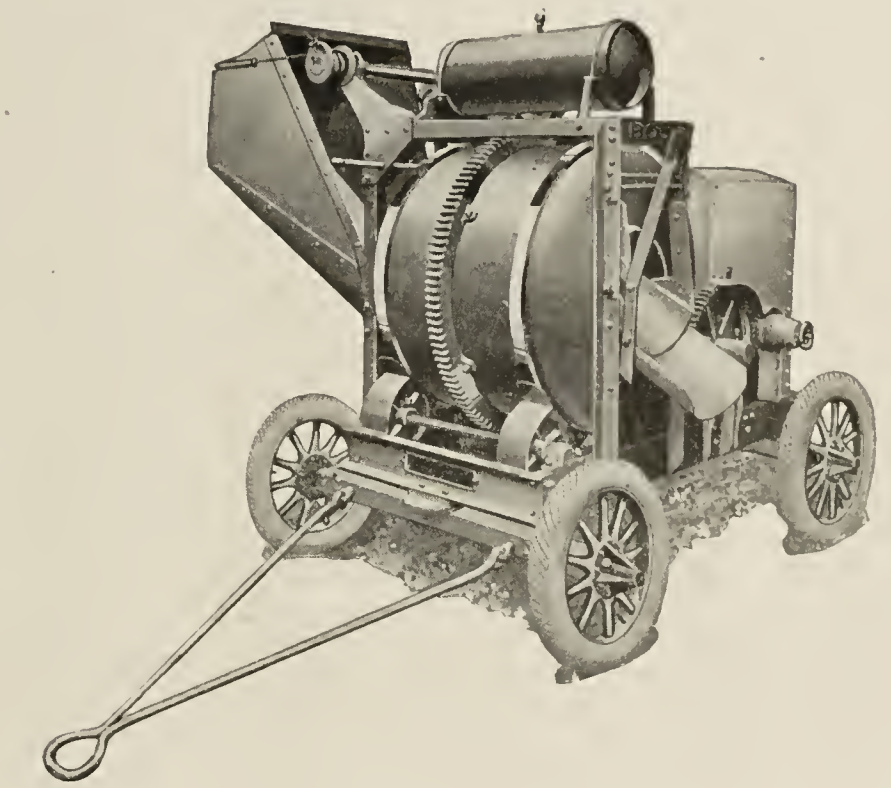
Crane and Hoist

The Northern Engineering Works, of 210 Chene Street, Detroit, Michigan, has issued a new "Pigeonhole reminder" for crane and hoist users, illustrating the various types of electric traveling cranes, gantries and electric hoists they are manufacturing. They are also extensive manufacturers of hand-power traveling and jib cranes of various approved designs.

Rubber Tired Mixers

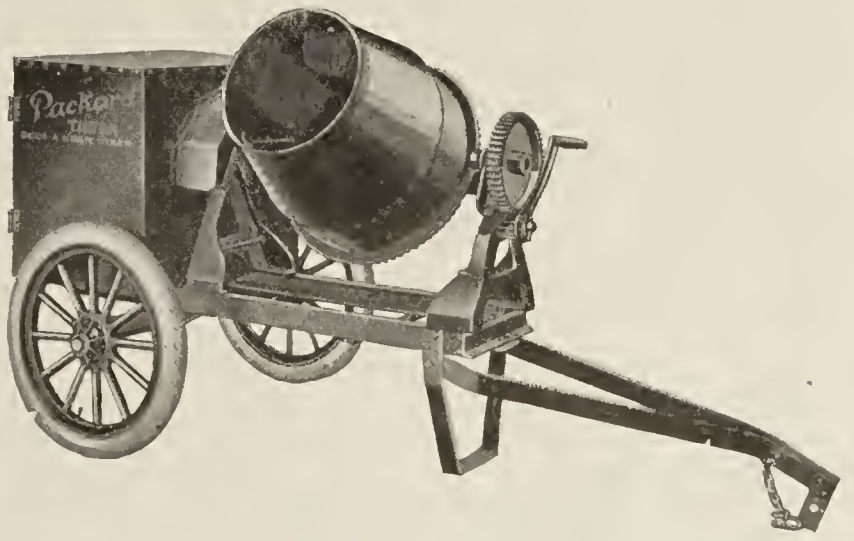
Nearly all mixers are now moved about jobs hitched back of a truck, though originally intended to be pulled back of horse drawn rigs on account of small steel wheels, with result that not only do wheels and axles give out at the 14 to 20 mile speed (while made for 4 to 5 miles) but the hard jolting and rattling soon works bolts loose, parts come out of alignment, battery and engine parts harmed and result breakdowns and delays.

BOSS engineers find by using not less than 30 inch



wheels with pneumatic tires, all the noise and rattling is eliminated and the serious objection raised in lots of cities to the harm done by the small steel wheels to pavements is overcome.

BOSS one bag mixers manufactured by American Cement Machine Co., Keokuk, Iowa, are now furnished with four wheel trucks equipped all around with cord tires and the Handy Size PACKARD Tilt-



ing Mixers on two wheel Ford trailer trucks. The extra cost is very small compared to savings in lost time due to delays formerly experienced.

In mixing, blocks can be used under axles taking all strain off tires with result that outfits out over year show practically no wear. In event of replacement, Ford standard tires used and on account large volume used they can be bought new or used at very low prices.

Investigate this situation before buying.

News of the Cement Mills

Alpha Portland Ceement Co., Catskill, N. Y., has about completed the installation of a new conveyor system from the mills to the tramway, which extends the entire distance of more than a mile. New steel piers have been erected to support the tramway. A modern system of conveyors has been installed that will work automatically both in the crusher room of the mill and at the quarry end. Several changes have been made at the mill and at their completion the plant will be operated to full capacity with a full force of men.

Construction work on the immense $2,500,000 plant of the Western States Cement company near Davenport, Iowa was recently stopped.

No reason for the cessation of work was given but it is understood to be the result of industrial conditions. It was stated at the plant today that the cessation of work would possibly last for a year.

A. D. Standcliff, superintendent and a number of other expert cement men brought to Davenport from Independence, Kansas, where the company's headquarters are located, have returned there. Others are departing for various parts of the country.

The shutting-down of construction work was a complete surprise.

It is said that the company has already spent a million dollars on the new plant and that it would cost over another million to complete it. Had construction work continued it would have been a year before the plant would have been completed and in operation.

The Red Star Cement Co.'s efforts to clear the title of the site of its proposed new factory northwest of La Salle, Ill. assumed a more hopeful aspect last week when it was formally announced that the Matthiessen & Hegeler Zinc Co. has definitely decided to withdraw its claims against the property.

The zinc company is one of the groups which has laid legal claim to mineral rights on the Kinder property, the proposed factory site, and it is an effort to finally determine ownership of these minerals that the pending court proceedings are being waged.

Although there was nothing definite on the point. It also was reported that the La Salle County Carbon Coal company might consider withdrawal of its litigation, now that the M. & H. Zinc Co., has taken this step.

The claims of the zinc and coal companies were identical except that they referred to different sections of the property in question.

The original contention of the zinc company (and it also is the basis of the coal company claim) was that when the agricultural surface was transferred to the predecessors of the Kinders, the instruments of transfer specifically reserved "coal and other minerals."

The rights to the "coal and other minerals," they contended, eventually came into their possession through a series of transfers involving the original Cowey's Chicago Coal Co., and the Northern Illinois Coal & Iron Co., from which they received their title.

The Pacific Portland Cement Company, Cons., in a complaint against the Southern Pacific Company to the Railroad Commission, has asked for reparation on shipments of lime rock from Flint to Tolenas. The reparation is asked on all shipments moving in the last two years and the measure of reparation is stated to be the difference between 50 cents a ton, declared to be the lawful rate, and charges of 70 and 90 cents a ton alleged to have been made.

The installation of a complete cement mill is under way at Ironton, Ohio by the Alpha Portland Cement Company. With the addition of the new mill the finishing department will consist of four of these huge mills. The grinding capacity of each is estimated to be about 50 bbls. per hour and an average of 3,000 bbls. is ground every 24 hours.

The Bath Portland Cement Co., Finance Building, Philadelphia, operating a large mill at Bath, Pa., is taking bids for the erection of a new plant at Sandts Eddy, near Easton, Northampton County. The company purchased a tract of fine property at this place some time ago, richly underlaid with cement rock, and had plans prepared for the mill. Estimates of cost, however, at that time exceeded $2,000,000, and the project, accordingly, was held in abeyance. It is expected that the plant, as designed, can now be built for $1,750,000, complete, and on this basis, the work will proceed at once. The plant will be equipped for electric operation in all departments and will duplicate to a large extent the present mill at Bath. It will have a capacity of about 4,000 barrels a day. The company has also arranged an appropriation of $300,000 for improvements in the Bath plant, and a large part of the fund will be used for the complete electrification of the mill, now about 30 per cent completed. A power plant will be constructed, with installation of a 4,000-horsepower turbo-generator. The capacity of the mill, at the same time, will be increased to about 4,000 barrels daily. At a recent annual meeting, the following officers were elected: Louis Rafetto, president; Fred B. Franks, first vice-president; Walter Dutton, second vice-president; Herbert Rafetto, third vice-president; F. P. Hahneman, Philadelphia, secretary; and John Barnes, treasurer.

Glens Falls Portland Cement Co., Glens Falls, N. Y., plans to enlarge its capacity for the manufacture of cement. The company proposes to erect a reinforced concrete building for the storage of stone and clinker, which building will be divided into two parts, one for stone and one for clinker. It is planned to install a new system for cooling clinker and also a new crushing plant will be erected. When this work is done it will warrant more kilns, which will be installed at a cost of about $250,000. The company within the next year will utilize the waste gases from the kilns stacks for the development of power.

The Oregon Portland Cement Company has announced that it has definitely decided upon the plan of erecting a substantial and modern club house, in the vicinity of its tennis courts, the house to be conducted by the membership and to be made self-sustaining. The membership will not be limited to employes of the company, but will take in any residents of Oswego and vicinity desiring to affiliate with the organization. The proposed new building plans, which have been decided upon, will cost $7,000, and will be of stucco construction, with a large swimming tank and shower baths in a 7 foot basement.

A Three-Fold Service

THROUGH the past fifty years great progress has been made in the development of efficient and economical explosives. And in practically every case the du Pont Chemical Engineer has been the pioneer.

A staff of three hundred chemical engineers in the du Pont Laboratories—by painstaking research, study and experiment—are anticipating the needs of Industry for safer and more economical explosives.

In the du Pont Laboratories, Low-Freezing Dynamites—eliminating the thawing hazard—were first originated and developed to their present highly efficient state.

In 1907 a Low-Freezing Ammonia Dynamite was introduced. What it has thus far saved in lives and money is inestimable.

Du Pont Explosives Service is three-fold. It assures you first, of the rigid maintenance of du Pont quality, second, the counsel of a staff of practical explosive experts to work out your own particular problems—third, system of manufacture and distribution that guarantees quick delivery.

Put your explosives problems up to du Pont.

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Pittsburgh, Pa.
Portland, Ore.
St. Louis, Mo.
San Francisco, Calif.
Scranton, Pa.
Seattle, Wash.
Spokane, Wash.
Springfield, Ill.

Du Pont Products Exhibit
Atlantic City, N. J.

News of the Concrete Products Factories

Manufacturing concrete products is an all-year business according to Urban John Meuer, of the Madko Concrete Products Co., Madison, Wis.

"We sell to practically all the contractors in the city," says Mr. Meuer. "Our heaviest business comes in the fall of the year, starting in October and continuing during the winter months. With the process such as is used by our company, namely that of steam curing and then drying the block before placing them in the yard to season, there is no chance of freezing, and when the block are laid in the wall the erection of the superstructure can proceed without delay."

Products manufacturers contemplating winter operation will find much helpful information in the booklet "Making Concrete and Cement Products in Winter," and the blueprint showing a recommended design for a winter curing chamber. These publications can be obtained free from the Portland Cement Association, Conway bldg., Chicago.

I. Colosimo, 100 W. 7th St. Gary, Ind., has patented the "Colosimo Damp-proof concrete block" which have demonstrated that where they are used the interior plaster coat may be applied directly upon the interior surface of the wall without danger of percolation or condensation. By the design of the block, a wall constructed of them has no continuous concrete bond between the interior and exterior surfaces. The arrangement of the air spaces in the wall is such that a free circulation of air is permitted throughout the wall in both vertical and horizontal courses. Having demonstrated that his invention is successful in ordinary building construction, Mr. Colosimo is perfecting an automatic machine with power tamper for the manufacture of Colosimo dry wall block.

Winamac Cement Products Co., Winamac, Ind., manufacturers of silos, blocks, tile, ornamental post and turns, are building a large addition to their factory which will contain new steam curing rooms, more wareroom space and more raw material space.

The Concrete Products Co., Birmingham, Ala., R. L. Morrison general manager, is making a line of ornamental concrete, including urns, flower boxes, pedestals and benches, on which the finish is extremely informal and rustic. The products are cast to an approximate shape in plaster or wood molds, and when still green are carved and scratched to get the results shown in the illustrations. The mixture used is the same as the company employs in making its roof tile, a 1:2½ mixture of cement and sand. White cement is employed in all the exposed surfaces on ornamental work.

An all steel set of molds for making concrete laundry tubs by the vibratory process or by the usual pouring method have been developed and are now on the market. This set of molds as now sold are the result of a number of experiments made to ascertain the type of mold which would stand the vibration and which would permit of easy stripping from the concrete tub or tray after the concrete had set.

Vibrators have proven their merit in the manufacture of cast concrete products but should be used in conjunction with molds which are so designed as to withstand the vibration which is necessary to consolidate the concrete. If the molds are not designed to remain in position and assembled, it is to be expected that the best results will not be attained. E. M. Camp, 2409 N. Ashland ave., Chicago, says he has solved the problems connected with the design, manufacture, assembling, and stripping of a practicable mold for the manufacture of high-grade concrete laundry tubs on an efficient basis.

A handy little gauge is used by the Voelker Realty Company, Dubuque, Iowa, to insure accuracy in laying up concrete block. It consists of three pieces of iron one-fourth inch thick riveted together with strips across the ends.

The gauge is laid on the block, the closed portion in the center covering the opening in the block. Motar is then spread in the open spaces and struck off even with the top of the gauge. This leaves an equal thickness of mortar at all points and insures straight, even mortar joints and regular blockcourses.

By reason of a purchase of machinery and its installation here, the Waterloo Concrete corporation, 1700 Water street, Waterloo, Ia., is now prepared to manufacture all parts that go to make up a concrete stave silo, excepting rods, which would necessitate the purchase of a special machine, and lugs which are cast, they having no foundry.

The accessories that will be made with the new machinery include concrete roofs for the silos, wooden doors, ladders and metal hardware. The company will also make steel farm gates, as machinery for these was included in the purchase.

Concrete pipe for practically all culverts in Spokane county road construction work last year has been furnished by the Spokane Concrete Pipe Company, Spokane, Wash. Equipment for making concrete laundry trays was recently installed at the factory.

They are shipping pipe to Hayden lake for 15 miles of irrigation ditch in the Honeysuckle farm district, and are running two shifts at the plant, employing on an average of 12 men to the shift. The firm has furnished culvert pipe for the following concrete roads this year: Trent, Medical Lake, Denison, Rockford, Pantops, Mount Hope, Greenacres-Saltese, Peone Prairie and Spangle.

Construction of the proposed plant of the Bend Concrete Pipe Co. at Klamath Falls, Oregon, will begin next week, it was announced recently by Manager C. H. Knowles of Bend, Oreg. He was accompanied by C. Spies, president of the Concrete Pipe Co. of Portland. While at Klamath Falls they arranged final details of the contract for laying six miles of sewer pipe there.

Branching out into the manufacture of cement products, Ralp Welch, a cement contractor of Orange, Calif., announces the opening of a new plant at 329 West Maple avenue, where every kind of cement product, from highly ornamental to plain, but dignified types, will be turned out.

Cement brick, blocks, flower pots, fancy mantles, ornate porch trimmings and many other types of cement products will be manufactured.

Cement and Engineering News

Vol. 35 Chicago, FEBRUARY, 1923 No. 2

Accident Prevention

Among other educational work which the Portland Cement Association co-operates in with its members is accident prevention in cement manufacturing plants.

Amazing strides have been made in the past two or three years in educating cement plant workmen to exercise a greater care of their persons when following their daily tasks.

How successful these efforts have been was never better presented than in the report of the Portland Cement Association Committee on Accident Prevention and Insurance, read at our Annual Meeting, November 22 and published elsewhere in this issue.

And anyone who thinks that this record of success is not live industrial news distinctly in the interest of common welfare isn't geared with the wheels of progress.

Cast Stone Suited for Bank Interior

Beautiful Effects Obtained with White Cement Cast Stone in the Lafayette National Bank by James G. Davis Co., Buffalo, N. Y.

Most examples of the use of fine cast stone are those where it is employed for exterior decoration. It is often considered that because of the protection from moisture and weather, the ordinary plaster mouldings, column caps, etc., are quite adequate for interior work.

Where, however, it is necessary to have the texture, solidity and richness of appearance of stone in order to carry out some particular architectural treatment of an interior there cast stone finds its place. When the choice lies between cast stone and cut stone, there are a number of factors which make cast stone worthy of careful consideration—these are low cost and the range of color and textures possible in cast stone.

In the Lafayette National Bank Building at Buffalo, the Architects, Bley & Lyman, wished to secure the texture and rich elegance of natural stone—together with a color sufficiently warm in tone to avoid the cold appearance of a pure white color. Cast stone was fixed upon because it met these requirements with the added advantage of a reasonable cost.

Sufficient buff mortar color was used to relieve the pure whiteness of White Portland Cement and the white sand. The caps of the two-story columns were precast at our factory, while the work on walls and ceilings was cast in place. Designs for the ornamentation were made by the architects but we were allowed full freedom in the execution.

To the ordinary observer, the work has the appearance of a very high grade, costly and elaborate work in cut stone. And why should it not? Cast stone is in its nature and composition exactly the same as natural cut stone. We do not take a block of bronze and laboriously cut from it a statue or ornament. Why? Because with infinitely less labor, bronze may be melted and cast into the desired shape. By means of Portland cement, we give to stone a temporary plasticity, cast it into molds and thus produce a synthetic stone. Surely this process is not an imitation of natural stone in the ordinary sense of the word. And by its use we lessen cost and labor—two worthy results where there is no sacrifice of beauty and utility.

Retarded Plastic Stucco for Dash Coat Work

Information on the subject of portland cement stucco is always timely but more so now than in the past, due to the 25 house plans now being issued by the Portland Cement Association. All of the plans call for portland cement stucco finish on concrete block walls. The Sandusky Cement Co. has prepared specifications regarding the use of Medusha white cement and Medusa waterproofed white cement which is reprinted herewith for the benefit of the concrete industry.

For some years past there has been a demand for a particularly plastic finish coat of portland cement stucco, which would have the strength, endurance and waterproof quality of portland cement stucco, and, at the same time remain sufficiently plastic for a reasonable period after application to permit throwing on, or dashing on, to such finish coats, crushed marble, granite, oyster shell fragments, etc.

The ordinary stucco mixtures of portland cement and sand are so dense as to render them too stiff for this purpose—material dashed or thrown on being unable to penetrate the dense, compact mixture even in many cases, immediately after the application of such stucco to the wall.

What has been required accordingly, is a portland cement stucco possessing all the good qualities of such but with the added quality of remaining in a sticky, soft and plastic condition for a period of from 30 minutes to 1 hour after being applied to the wall.

Specifications

Where old concrete or concrete block is employed, it must be thoroughly cleaned by scrubbing with a solution of 1 part muriatic acid in 10 parts water, and the surface well rinsed with water from a hose, as soon as the acid has stopped foaming.

Wet the surface thoroughly and apply a creamy mixture of cement and water, to which 2% of Medusa waterproofing has been added. This grout can be applied with an ordinary brush but should not be used very far in advance of the plastering, so that the grout

paint will not have an opportunity to harden before the plaster is applied.

If the stucco is applied to hollow tile, old stucco, brick, concrete block or other absorbent base, such base must be saturated with water before applying the fresh stucco.

The methods of application and specifications previously given in detail must be used with careful attention to all precautions.

First Coat or Scratch Coat.—Gray portland cement—1 part; clean, screened, sharp sand—3 parts; hydrated lime, 10% by weight of cement (10 lbs. to the sack of cement); Medusa waterproofing, 2% by weight of cement (2 lbs. per sack of cement). Scratch, or roughen surface with stiff brush or broom, before material reaches initial set.

Second Coat or Brown Coat.—A second or brown coat may be employed as described under the general stucco specifications, but is not in all cases essential.

Dash Coat or Finish Coat.—3/8-in. body. Medusa waterproofed white portland cement—1 part; clean white sand—1 part; rough asbestos sand—1 part; hydrated lime—10% by weight of cement (10 lbs. per sack of cement).

If Medusa plain white portland cement is used instead of Medusa waterproofed white cement, add 16 lbs. of Medusa waterproofing paste to 20 gals. of water used to temper the stucco.

Apply the aggregates by throwing them on forcibly as soon as possible after applying the finish coat.

Experiments indicate that the following mixtures give excellent results for plastic finish coats for dash work:

Medusa waterproofed white portland cement (or Medusa plain white portland cement with Medusa waterproofing, as above)—1 part; hydrated lime—10% by weight of the cement used; clean, sharp sand—1 part; rough asbestos sand—1 part; short asbestos fibre or finely-divided sawdust (wood flour)—½ part.

The extraordinary plasticity of finish stucco coats of this type is the result of the addition of a finely divided, water-absorbent material, such as asbestos or very fine sawdust, to the cement or to the cement and sand mixtures; and the fact that such water-absorbent materials retain more water in the portland cement stuccos to which they are added than such mixtures would retain without them.

The plasticity in this case is not a question of setting time of the cement itself, but of a lessening of the density of a mixture of cement, sand and water, by increasing the amount of water present in the mixture, without appreciably reducing the coherence and tenacity of such mixture.

Portland cement stucco, cement plaster and concrete containing asbestos is not new, having been the subject of a great deal of experiment and considerable use on a commercial scale where extreme lightness, strength and plasticity are required, particularly in the manufacture of portland cement shingles, and to a greater or less extent in stucco work, for some years.

A Concrete Trough for Transporting Tomatoes

By C. R. Millhouse, Columbia Conserve Co., Indianapolis, Indiana.

One of the most interesting pieces of concrete construction we know of is the concrete tomato trough which we have just recently completed. This trough, half full of water kept flowing by a pressure system, is the best means of conveying tomatoes from the cars to our factory.

The trough is about 150 ft. long and 2 ft. deep with an average depth of about 3 ft. It is all made of concrete supported on piers 11½ ft. apart. The tomatoes flow down with the water in this trough to deflecting screens, which hold the tomatoes and allow the water to pass on. The screens are placed at arms of the trough, into which elevating conveyors are laid down by means of which the tomatoes are taken up and put through the canning process. The whole thing is a success. The outside form was lined with building paper. (If we were doing this again we would use roofing paper, as the building paper when it became wet wrinkled in places.) The inside form was made of tongue and groove flooring made perfectly smooth and hung from supporting 2x4's as shown in the illustration. The horizontal supporting pieces are bolted to the vertical pieces so that the inside form may be loosened and moved along as the concreting progressed. The bottom of the inside form was made slightly curved, in order to give the air a chance to escape as the concrete was run under the form. By jarring this form as the mixture was run in, we had no trouble from air pockets. The concreting was carried on continuously carrying both sides along as nearly even as possible.

Hand Book of Construction Cost

The new book published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y., entitled Hand Book of Construction Cost by H. P. Gillette, Editor of Engineering and Contracting is a book that helps you take the guess out of estimating. It is a book offering more than 1,700 pages of carefully itemized modern costs on every phase of construction work. This book is a companion volume to Gillette's Handbook of Cost Data and to Gillette and Dana's Mechanical and Electrical Cost Data. There is no duplication of material in the books.

There are twenty-three chapters of detailed costs of actual jobs covering every phase of construction work from hauling and excavation to painting bridges.

In addition to this priceless cost information there are two chapters that

(1) show the value of using accurate cost data;

(2) explain how to make a rapid and preliminary estimate of cost;

(3) give a typical complete cost estimate as an example;

(4) discuss factors a contractor should consider in making estimates;

(5) give Mr. Gillette's formula for commodity price levels and also his formula for wage levels.

Special attention is given to engineering, surveying and overhead costs.

The chapter on building construction costs is especially thorough and complete. It gives costs on:—school buildings, warehouses, hospitals, loft building, railway buildings, storage shed, small houses, concrete power houses, church, frame residence, foundations, piling, floors, lathing and plastering, roofs, stucco finish for concrete house, etc., etc.

The book has 1,734 pages, 4½x7, flexible, fully illustrated, $6.00 net, postpaid. Examine this new cost data book for ten days free.

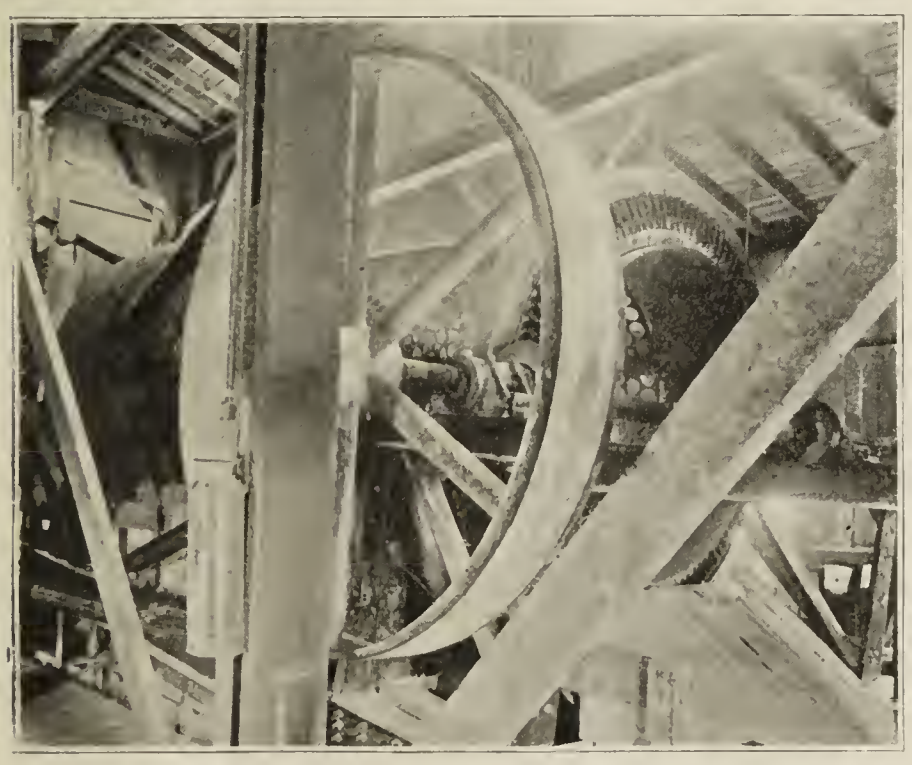
Interesting Installations in a Modern Ohio Quarry and Crushing Plant

At the plant of John Herzog & Son, Forest, Ohio, may be viewed what is claimed to be the last word in superb equipment for the crushing of the stone and for the hauling of the side dump cars from quarry to plant. These important phases in the production and the consequent marketing of the product of the quarry is one which has received untiring attention and consideration from those qualified to put forth the best thought and accumulative intelligence on the subject, whether by actual quarrying, hauling or crushing experiences or whose chief interest is the supplying of crushing and quarry equipment.

To these features the general manager, Bert Herzog, who is an expert in crushing and quarry development and whose extensive knowledge of quarrying and crushing management has long been recognized, has devoted much of his energy in the quest for economical hauling and crushing operations.

The illustration on this page gives an accurate idea of the general arrangement of the crusher and screening building.

View of John Herzog quarry, showing Plymouth gasoline locomotive drawing side dump cars from quarry to crusher building.



Revolving screen and drive—John Herzog & Son.

After being blasted the stone is excavated with a Marion railroad type steam shovel equipped with Taylor Mesaba chain and loaded into side dump cars and brought to the crusher building by Plymouth gasoline locomotive. The dump cars discharge into a hopper which loads the stone onto an inclined feeder 48 inches wide by 30 feet centers. The pans of this feeder are protected from excessive wear by heavy maple liners bolted in each pan. At the head end of the pan conveyor feeder the material is directed into a Williams Mammoth crusher for sizing. Underneath the crusher a special steel chute transfers the crushed stone to the main belt conveyor.

By crushing 48″ stone to 1½″ in one operation, the Williams Mammoth crusher takes the place of a preliminary and two secondary crushers. It also eliminates the connecting elevators and conveyors and reduces housing requirements. It has effected an investment saving of $20,000. Mr. Bert Herzog states their Williams Mammoth crusher is saving them $46,000.00 each year in crushing plant operating costs, not to mention a considerable saving in power which they have no means of computing. He further states that their cost per ton of crushing rock has been cut 53 per cent.

The belt conveyor operates on an incline and is equipped with a 30" 8 ply belt (made by United States Rubber Co.) with 1/8-inch rubber cover on the carrying side. The centers of the conveyor are approximately 350 feet. The conveyor is supported in a gallery which is entirely enclosed and which extends from the crusher building to the screening and storage building. A wide walkway is provided at the side of the conveyor for the purpose of inspection and adjustment of the equipment. The belt is supported by ball bearing carriers of all steel construction. At the head end of the belt conveyor the stone is spouted into a revolving screen. The screen is carried on a heavy timber frame and is mounted on a slight incline and is equipped with an outer jacket. With this screen four sizes of product may be obtained. The sized stones drops in the large storage bins below which are provided with compartments for the separation of the different classes of product. The bins are furnished with gates for loading directly into railroad cars or into auto trucks as required. Plants of this character are being installed in many districts throughout the country where crushed and sized stone is in demand for railroad ballast, road construction and other general uses.

Money From "Empty" Sacks

In every empty cement sack returned to the building supply dealer's warehouse there is actually a sum of money lying latent in the form of loose cement which the workmen could not shake out because it clung to the cloth. In fact, the workmen at the construction job have not the time to thorougly empty every sack of cement. So some of the aggressive concrete product manufacturers, contractors and supply men of today have installed in their warehouses a practically new device for extracting the remaining cement from empty bags. Their testimony proves beyond a doubt that a bag cleaning machine is not merely a money saver, but a money maker, and that it literally pours dollars into the treasury of their firms.

The comments upon this profit-earning system relate particularly to a unit made by the Handy Sack Baler Co., 620 S. Second St., Cedar Rapids, Ia. It is called the Unit Sack Cleaner. The first is an experience of a certain central western dealer who in giving a talk on cost accounting at his state convention recently, told how he made the disagreable job of bundling dusty cement sacks into an attractive and profitable proposition.

How Sacks Used to be Handled

Like most of his fellow dealers, he had for many years handled his empty sack account in the usual slipshod manner, piling empties in one corner of the warehouse, shaking them by hand to determine as best he could the brand marked on the front, and then baling them up dirty and more or less stiff as the result of careless usage by the consumer. Often times bags would accumulate until the pile assumed huge proportions because it was difficult to secure labor to do the unpleasant job of bundling them. Only when he sorely felt the necessity of getting credit for the empty sacks at the mill did he tackle the proposition and get it done for a while. When the credit memorandum did arrive, with the burdensome rejections for "foreign," "wet," and "worthless" sacks, he was prone to feel that the mill was not treating him fairly in the matter.

And Then He Took Up—

But early in 1920 he determined to systemize his sack account. First of all he built a separate warehouse through which all empty cement sacks should pass for cleaning, inspection, baling and returning to the mill for the proper credit. This plant cost him $800. In it the enterprising dealer installed a Unit Sack Cleaner at an additional expense of about $500, employing a man at $30 per week to take full charge of the new department.

This workman inspected all bags as they were returned from the customers. Then he put them in the cleaner. Practically every bit of cement was removed from them, making quite a heap in the bottom of the cleaner from every batch that was put in. Then this dealer discovered that it was quite easy to patch torn bags when they were cleaned, so he installed a sewing machine and the same man in charge sewed up the tears. Then the sacks were baled in bundles of fifty, according to their various brands, which could also be distinctly read after cleaning. With all the cement out of the sacks it was found that the freight rate was considerably less for each bundle than previously, being cut nearly in half.

Salvaged Cement Paid For All Expenses

At the end of the season, or about ten months after the inauguration of this new system, the dealer found that the income from the salvaged cement, as well as the decreased freight cost, completely paid for the expenses of the warehouse, the sack cleaning machine and the laborer's salary for the entire period. He also says he now feels that the mills are fair in their inspection instead of his former conception of them as trying to profiteer on their sack accounts.

While the cement taken from returned sacks cannot be used for the very fine work in cement construction, it is perfectly suitable for foundations and heavy work of that nature where appearance is not the prime factor.

Cleans Sacks Faster Than Men Bundle

Many dealers around the country are not familiar with this method of cleaning cement sacks, and are still plodding along under the old system. In Elmira, N. Y., is a dealer firm which has placed one of these machines in their warehouse. It is the Dudley W. Leavitt & Co., prominent members of the trade in that section of the Empire State. They say of their experience:

"This machine is entirely practical and useful. We find that the cement saved in cleaning the sacks more than pays for cleaning and tying them ready for shipment. We get one sack of cement out of every 100 bags cleaned. The sacks come out of the machine in fine shape and we feel we save a lot of money by using this machine, owing to the fact that not nearly as many sacks are rejected when shipped back to the mill. This unit will clean bags faster than two men can straighten them out and bundle them, and a batch of 100 can be cleaned in from 15 to 20 minutes. It is one of the most useful pieces of equipment we have around our place. We are perfectly satisfied with it and feel that it is a great money saver."

In building the new $2,000,000 concrete factory building, at Cleveland, for the Fisher Body Company, where the concrete aggregated approximately 50,000 cubic yards, spread over an expanse of about 2,500 feet in length, the cement bags, of which there were close to a half million, were shaken with most satisfactory results by two electrically driven Handy shakers, and baled with two standard hand-operated Handy baling machines, writes V. E. Winell, superintendent Thompson Starrett Co., Contractors, 701 Lincoln Bldg., Detroit, Mich.

Concrete Products as a Side Line Pay Good Profits

By R. D. Winkworth, Winkworth Fuel & Supply Co.,
Detroit, Michigan.

In this article Mr. Winkworth tells of the success his company has had in the manufacture and sale of concrete products in addition to their regular business of selling building supplies.

About three years ago we noticed that there was a good market in our territory for concrete blocks, particularly for foundation work. We had all the materials necessary for making the blocks—first-class sand and gravel in great quantity and cement which we carry in stock. We also had men in our employ who were not very busy at certain times during the year, and we thought if we could use the spare time of these men in work on the manufacture of blocks, we might be able to sell finished concrete blocks and make a very fair profit on them, inasmuch as they could be manufactured very economically.

We therefore went into the subject in detail and sought information on the best machines and layout to use, together with figures on the cost of such an installation.

We get our sand and gravel from barge shipments which are unloaded in great piles on one of our lots which lies on the river's edge. On this lot was an old, abandoned one-story brick building which had formerly been used as a blacksmith's shop. This buillding stood about one hundred feet away from the river, and we thought it might serve as a starter for our concrete products plant.

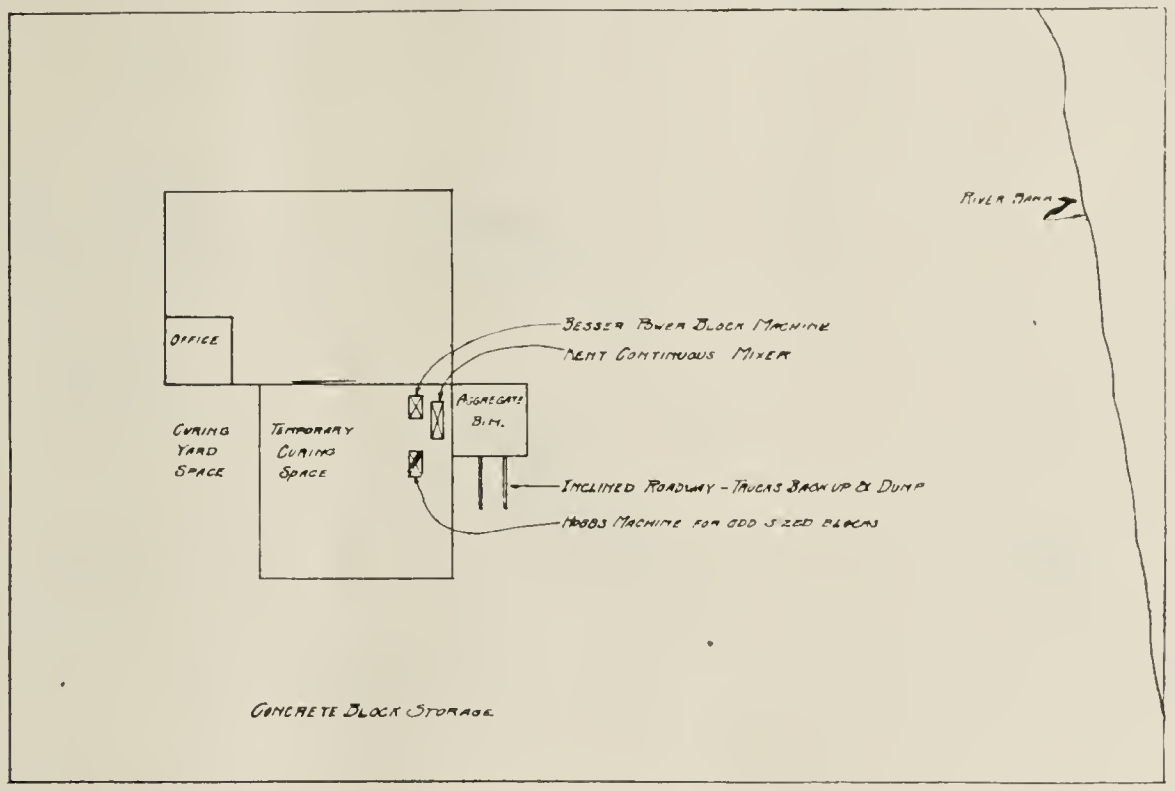
We secured a first-class concrete block machine, and employed a man to take charge of the business, with the understanding that he would make use of our yard help so far as possible, when their time permitted, and later take on such additional help as conditions might warrant.

The problem of conveying the sand and gravel to this plant came up, and about the same time we wanted to get a more economical way of loading our wagons which supplied our trade from these same material piles.

We tried out a portable power conveyor and discovered that it worked nicely. We found a ready sale for the entire output of our plant, and very soon it became necessary to build an addition, in the way of a lean-to at one side o fthe brick building, and add another concrete block machine, for preparing faced block and special pieces. Although our first machine could turn these out, we thought it better not to have to take time to change the plates, but to keep the first machine running steadily on standard blocks and utilize the second machine for all the extras and special pieces.

Some very attractive surface finishes, were obtained with our local aggregates in combination with white cement and there was a good demand for special pieces of window trim, chimney blocks, and so on, as well as steadily growing demand for the standard, plain blocks.

The business has developed to such an extent that we now have to put in an office to handle the sale of the products from this yard—concrete blocks, sand and gravel. The method of getting blocks away from the block machine to the curing yard is one that is very important. It is necessary, of course, that they be handled carefully, so that the corners of the green blocks are not broken.



Layout of Concrete block plant

We have found a satisfactory method by laying a concrete floor with a smooth, carefully troweled finish, over which we operate a jack lift truck, which makes the handling of blocks easy and prevents all damage.

At the present our storage is just an open-air area, but we keep the blocks sprinkled thoroughly several times a day and are able to turn out a very hard dense block, on which a recent strength test showed 2,200 pounds. Without using any water-proofing and simply exercising care in the manufacture, we are able to turn out a product that is giving very good results, for which the demand is steadily increasing and which pays us a very fair profit.

The present outlook is very good. I should not be surprised to see business justify another unit. At present, we have two of the Besser type machines and also the Hobbs. The Besser type machine we use for eight inch blocks only, and the other for our special work. This arrangement enables us to get out maximum output of blocks that are in most demand.

We use a Kent continuous mixer which thoroughly mixes our aggregate and gives splendid satisfaction.

We have some trouble during the winter, with frozen gravel, but this we corrected by the use of steam in the hopper.

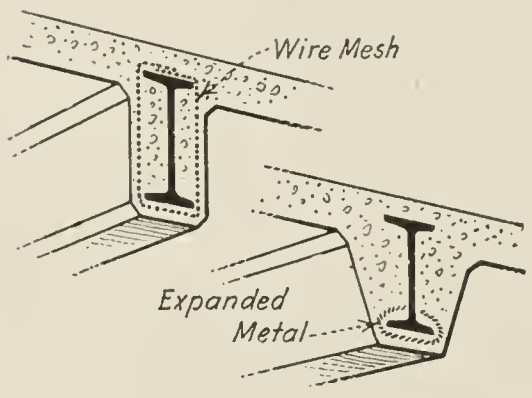
The concrete products operation opens up a splendid field and justifies very thoughtful consideration.

Encasing Structural Steel in Concrete

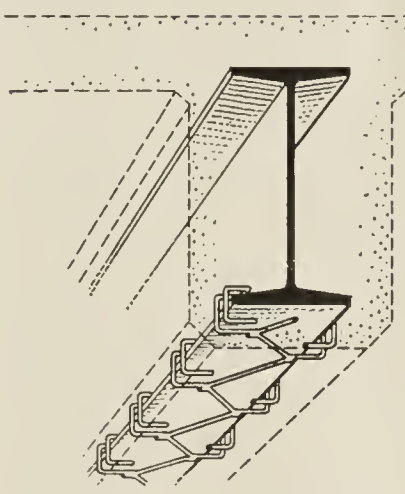
Structural steel members are encased in concrete for the purpose of protecting them from rust and corrosion, and from damage in case of fire.

Of course steel, when heated by fire to the point of redness, becomes soft and loses its strength, and for this reason some protection is necessary against fire.

It is difficult to be sure of a strong bond between the large flat surfaces of structural steel members and the concrete. In addition, structural steel is often given a coat of paint at the mill which may prevent adequate bond for the concrete.



Two methods of wrapping "I-beams." The complete wrapping of "I-beam" is preferable.



One of the commercial patented clips for attaching to lower flange of "I-beam."

For these reasons it is customary to provide some means of reinforcing the protective coating of concrete and forming a tie which holds the concrete to the steel. This is especially necessary in the case of a fire.

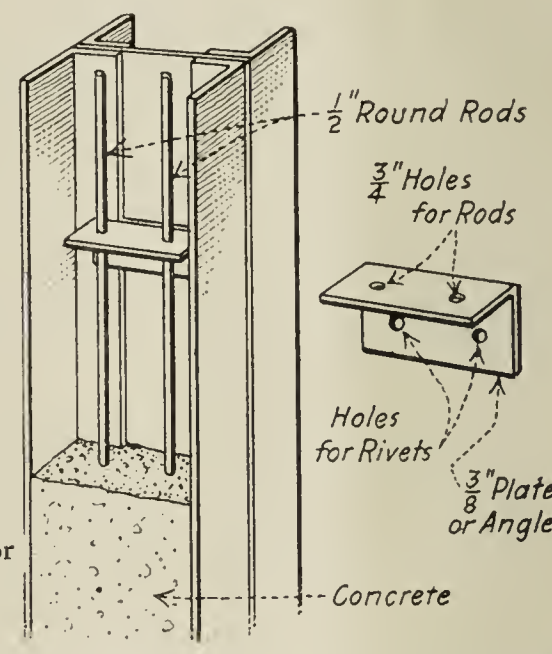
The bottom flanges of structural steel "I-beams" in floor systems should always have some means for securing this bond. The drawings shown give some of the methods employed in encasing structural steel. while most of the encasing of structural steel is by means of poured concrete, the use of the cement gun method for protecting steel is receiving much favorable consideration.

All-Steel Drill Outfit

The Armstrong Manufacturing Company, Waterloo, Iowa, has a successful record as drill manufacturers, covering a period of more than half a century.

Their new all-steel outfit is the result of more than three years constant study, work and improvement. It is built entirely of steel, except the band wheel and two sets of the larger bearings. The frame is built of angle steel on a heavy channel steel frame or chassis and there are no bolts in any part of it—every joint is hot riveted. It is built like a steel truss bridge, and found to be true and rigid even after being subjected to excessive and unusual warping or twisting strain. Being made entirely of steel this rig is not susceptible to injury if hit by a chance stone from a blast.

Yet the frame—the backbone of the rig—is only one of its unusually good features. It is equipped with either electric or gasoline power at the option of the buyer. It has an all steel derrick fitted with the Armstrong patents covering the use of wire line instead of Manila cable. This item in itself is one worthy of special mention, especially when you consider that a three-fourths inch wire line will last four or five times as long, thus reducing the cable cost per foot drilled to a minimum. This all steel rig is so designed and constructed that the speed with which it will penetrate rock formations will mean a big saving in the cost of drilling blast holes.



Method used for insuring a good bond when filling the trough of a structure steel column.

Novel Method of Selling Vaults

Leander Randolph, Tama, Ia., concrete burial vault manufacturer, is employing a very effective method of marketing his product. Like most manufacturers over the state, he sells his vaults through the undertaker. His system differs chiefly in the quantity sold at a single purchase.

Mr. Randolph's plan contemplates selling the undertaker a number of cards, each being good for one burial vault. A liberal discount is allowed for quantity orders, which makes an attractive proposition for the undertaker. When the undertaker needs a vault he takes the card to Mr. Randolph's plant and leaves instructions for delivery, which are written in spaces provided for this purpose on the card. This not only simplifies the undertaker's work, but the card also serves as a permanent record of the sale.

A Brief Description of the Cellular Type of Retaining Wall Used for Holding Embankments

G. WALLACE CALLAHAN, New York

Occasionally, in engineering practice, conditions arise when the general type of retaining wall is inapplicable, and it becomes necessary to devise a special type to meet the case. To meet such a demand, the cellular type o fretaining wall has been designed.

To such cases as those of embankments on narrow right-of-ways, where the slope would forbid the use of ordinary earth embankments, and the height would cause the section of an ordinary wall to be very large, this type of wall is especially applicable.

It consists, in the true type, of two parallel retaining walls joined at certain distances by the walls uniting them, utilizing the mutual action of the two face walls and effecting a marked reduction in the section of each. In this case, there is no base, and it is, in reality, two counterfort walls placed back to back with the counterforts united and the bases omitted.

Figure 1 gives the plan which shows the two face or retaining walls with the tie walls uniting them, while the section gives an idea of the tie walls. This wall was used by the Interborough Rapid Transit Company on the Eastern Parkway Improvement and is an example of the true type of cellular wall.

In design it is similar to that of a counterfort wall. The face walls between the ties are the longitudinal walls of the counterfort type between counterforts, and the short spans from the ties to the expansion joints are designed as cantilevers from the ties.

As the purpose of the tie walls is to join the two face walls, they will have to take this tension in the steel and need only be thick enough to protect the steel and to hold themselves, for which eight inches to a foot is sufficient in most cases. It must be especially remembered and specified, however, that the difference in level between two adjoining cells while back filling must never exceed four or five feet, or the unequal pressure will cause failure of the ties.

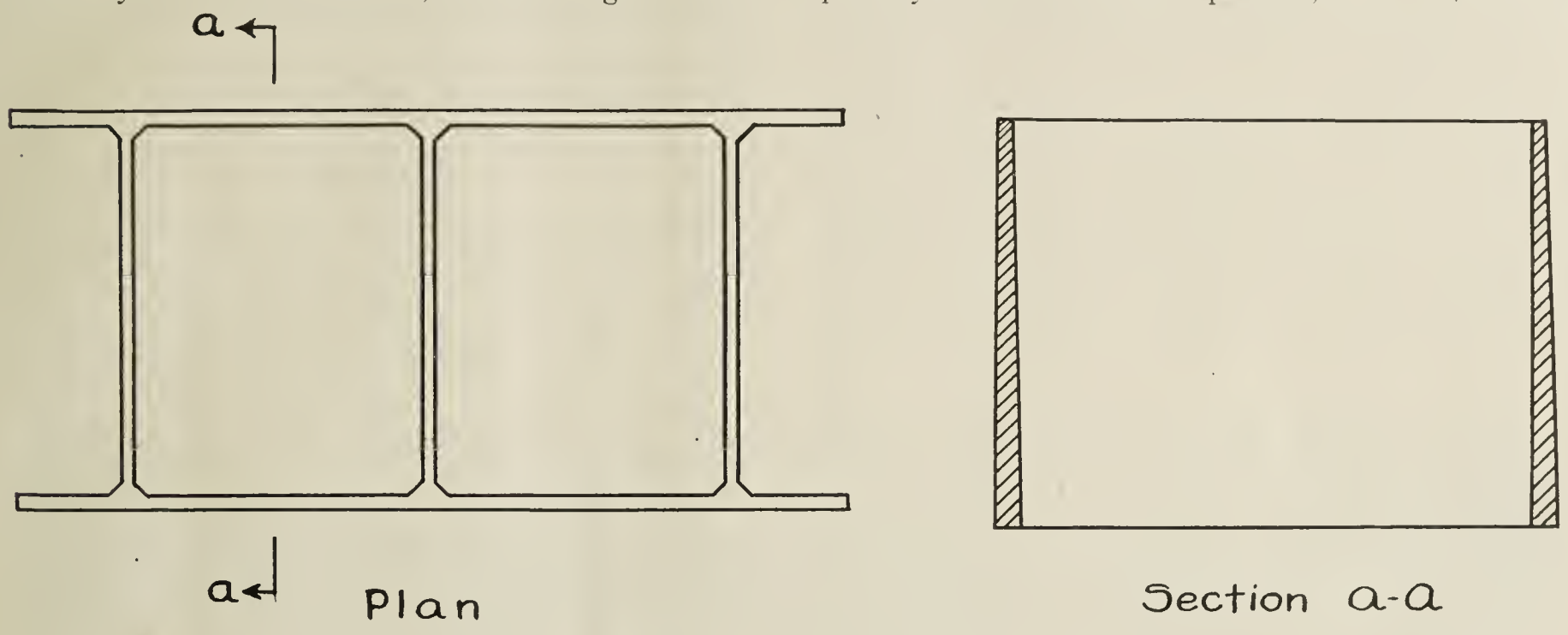


FIG. 1

The reinforcement should be continuous between expansion joints in the face wall and that from the tie walls should be carried around to the face and be well bonded as this steel must take all the thrusts that the tie is subject to.

When expansion joints are used as they are in most cases, they should be in the middle of a span of the face wall between two ties, and when the wall is being built, a section between two joints should be built before the adjoining sections are, so the faces of the joints may be well coated with asphalt before the next section is poured. An example of a good joint that will keep a wall in line is shown in Fig. 2.

As there is danger of accumulated water causing unexpected thrusts, sufficient seep holes should be

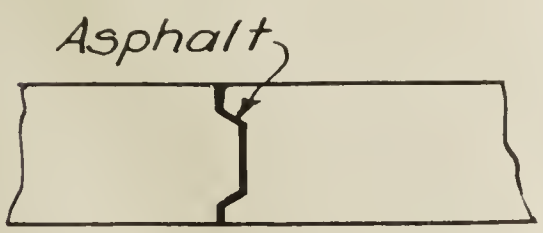


FIG. 2.

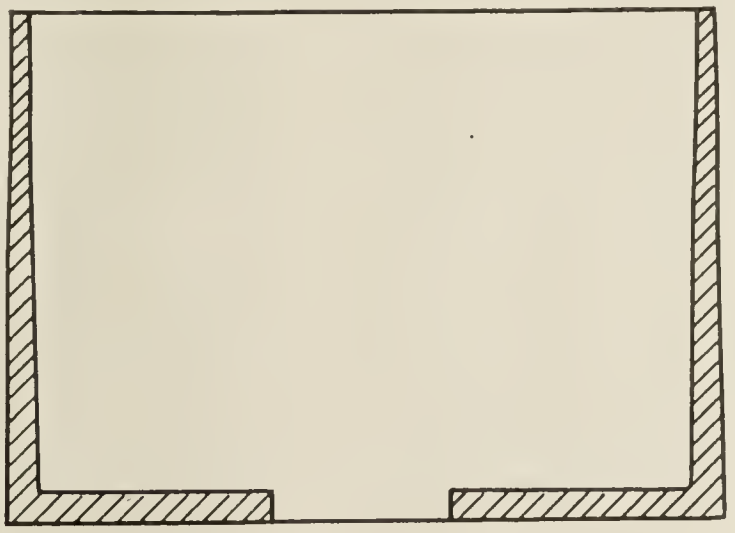


FIG. 3.

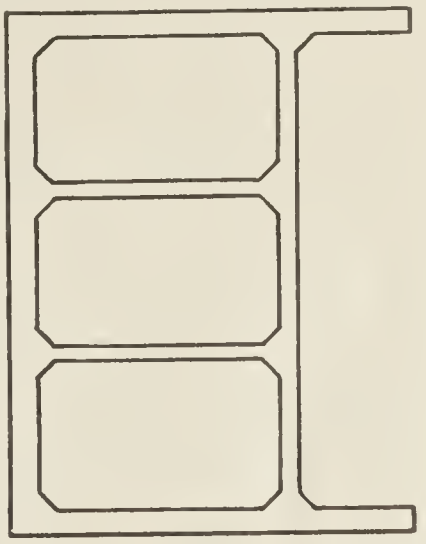


FIG. 4.

placed through the wall just below the ground surface. These may be small drain pipes or any other device that will not easily become clogged.

When there is danger of unequal settlement, or when the foundation is poor, a base is added, as shown in Fig. 3. The base is designed for the net difference between the upward and downward pressures similar to the base of a counterfort wall, and may be either continuous across the bottom or partial as needed.

Sometimes the structure must rest on piles and in that case the heads of the piles should be imbedded in six inches of concrete to hold them that they may act together.

When a wall of this type is used as an approach, the end of the wall forms an abutment and must be designed as such.

To do this, the abutment, the sidewalls, the ties and the earth within are considered as a unit acting against the force of the structure resting upon it and the earth pressure, and greatly increases stability. In fact, if the point of application of the superstructure is behind the toe of the wall, the only force tending to overturn the abutment is the force of the earth be-

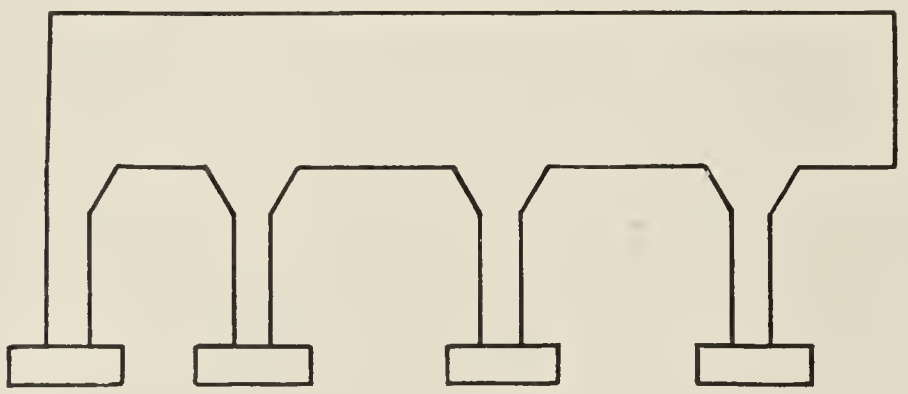


FIG. 5

hind the abutment wall itself.

It will be investigated for stability, sliding, and overturning as an ordinary abutment, but the section of the front wall can be greatly reduced. All parts should be strongly tied together by good bondage, and it is well to include at least one longitudinal tie wall between the abutment wall and the first cross tie wall as shown in Fig. 4. These ties will reduce the stress in the front wall and the cross tie wall which now has to take the pressure of earth in one direction.

If a base is needed it should be designed as before for the net difference between the upward and downward pressures.

When piles are needed the base is extended to include them, and their tops are imbedded in concrete as before.

Occasionally a case occurs when a good foundation can be obtained a short distance below the outside grade, or at any rate, when there is a difference between the bottom of the needed wall and where the foundation should rest. For such cases, the wall that is needed to retain the embankment may rest upon columns, which, in turn, rest upon the more favorable material, and so afford a greater saving in construction material than if the wall were carried down, though this must be carefully balanced against the greater cost of the forms to find the most economical solution of the problem on hand. (See Fig. 5.)

These columns and bases are designed as regular columns and footings and must be securely braced for any side movement by brackets to the bottom of the walls.

When an abutment is needed care must be taken in its design to have it rigid throughout and have the columns here more securely bracketed than before to withstand any overturning movement. The bases must be for the needs shown in the pressure diagram obtained where investigating for stability, etc., and must be securely bonded to the columns. Special attention must be paid to the requirements of rigidity in the structure as a great deal depends upon its acting as a whole, so it is well to brace the parts well by fillets and brackets.

While these walls are very interesting as examples of the adaptibility of reinforced concrete to unusual circumstances, it must be remembered that the cost of construction is very high, and it is to be feared that they cannot obtain very widespread use. Yet, they show the possibility of special designs for the solution of unusual problems and this in itself affords a certain pleasure to those who believe in the possibilities of the material in original design.

Books

Concrete Work—William K. Hatt and Walter C. Voss. Two volumes, 5¼ in. by 7⅝ in.; cloth, illustrated; John Wiley and Sons; Vol. 1, 451 pp., $4.00; Vol. 2, 206 pp., $2.00. Sent on receipt of price by Cement & Engineering News, 22 Quincy st., Chicago.

In these days of an almost universal quest for knowledge concerning the "how" and "why" of things, on the part of those engaged in the practical side of construction work, this addition to the Wiley Technical Series should find many readers. Prepared for the instruction of army men during the war, it is written in a manner that is easily understandable. The book contains no involved mathematics, a knowledge of arithmetic being sufficient preparation to read it. It is written primarily for those concrete workers of unguided experience who wish to attain positions of foremen or contractors on concrete construction.

The subject is presented in two volumes. Volume 1 contains the development of principles and information of methods of construction and standards, necessary for actual building construction. The chapter headings are: Opportunities in the Concrete Industry; Plans; Details and Specifications; Simple Footings; Column Footings; Concrete Walls; Reinforced Concrete Frames; Erection; Pre-Cast Stone; Walls and Partitions; Walks and Pavements; Building Finish; Special Construction and Estimating. The appendices contain information on Aggregates; Manufacture of Cement; Standard Specifications and Tests; Specifications for Concrete Storage Tanks and Reservoirs; Waterproof Construction and Data for Estimating.

Volume 2 contains 206 pages, 37 figures and 97 job sheets, that uncover to the worker the fundamental principles and operations of computing, selection of materials, mixing and placing of concrete. They may be classified into elementary operations; tests of materials; inspection of construction; construction methods; study of materials and methods; experiments and information.

Each job sheet involves a title, a direction or order to do a certain thing; a series of development questions, intended to develop the thought of the worker and to bring him to the point where he can make his own decisions from time to time upon the various situations that may confront him.

Foremen, local concrete contractors, and inspectors will find these volumes invaluable practical books of reference for everyday use. They fill the important gap between the theory of the engineer and the special technology of the contractor.

An "answer book" to the problems contained in this volume can be obtained from the publishers for 25 cents.

Fountain County's Bridge Over the Wabash River at Attica, Indiana

Three outstanding features mark with special interest the new bridge over the Wabash River, between Fountain and Warren counties, Indiana. The financing of a project of this character by a single county, the speed with which the undertaking was accomplished once it was decided upon, and the artistic merit of the structure. Details of the engineering design, the construction and other matters are omitted here because they possess less novelty—not because they are less creditable than other features.

Initial Consideration.—The first bridge at this location was a toll bridge built by private interests in 1860, and destroyed by a cyclone in 1886. Its contract cost was: Superstructure, $12,000; masonry, $8,160; total, $20,160. This original structure was replaced by an iron bridge which is now superseded by the concrete spans shown in the illustration below. Not only had the concentration of modern traffic quite outgrown the old bridge, but the structure had actually deteriorated to a point where it was obvious that it would have to be condemned at a not distant date.

At a meeting of leading citizens of Attica in the summer of 1919 it was decided that a new bridge must be sought, and that the project should be pushed. It developed that the road, of which this bridge was a link, was to be made a State road, but that the State was not prepared to stand the cost of the bridge; and, furthermore, that the county would be without power to build the bridge after the road had passed to the State. These circumstances made haste indispensable.

Financing.—Warren County, across the river, was invited to participate with Fountain County in the project, but after a meeting between the commissioners of both counties, the Warren representatives decided not to join. This placed the entire burden of financing upon Fountain County, but even so, it was decided to see the project through, and the necessary taxpayers' petition was completed Jan. 24, 1920.

The necessity for quick action had led county officials to undertake engineering and other preliminaries before the formal authorization of the project was complete. It was considered that the work could best be carried on under the direction of the State Highway Department, the services of which were accordingly secured, the county paying their cost.

The Highway Department began its surveys on Nov. 3, 1919. Test borings for foundations were unnecessary because the character of the ground was well known. By Dec. 1, detailed plans, estimates and specifications were finished.

On Feb. 9, 1920, the County Council appropriated $282,741, the exact amount of the estimate, and on Feb. 10 the contract for construction was let to the firm of Standish & Allan of Chicago, on a unit price basis totaling $272,540.30. The State of Indiana contributed $19,108 to cover bond discount not originally provided for; and the contractors gave $3,500 to aid in selling the bonds.

War Department and Congressional Approval.—The Wabash River at Attica is rated as a navigable stream by the War Department, although local citizens claim that it has not been navigable since 1832. An attempt to secure approval of the bridge from War Department officials at Louisville failed, and the matter was accordingly taken up at Washington. Authorization for the brige was signed by the Chief Engineer of the Department on March 1, and by the Secretary of War on March 3. This, it will be appreciated, came only as a result of prompt and energetic action by Fountain County officials.

A more serious problem was presented by the fact that because the Wabash River is in part an interstate stream, an act of Congress approving the construction was necessary in addition to the other authorization. The act was secured by the close co-operative efforts of County, State and Federal officials. The bill was passed by the House on Jan. 19, 1920; by the Senate on Jan. 26, and was signed by the President on Feb. 3.

The new bridge at Attica, Ind.

Artistic Merit of the Structure.—The beauty of the Attica bridge lies in its form—not in superficial ornamentation, and is so completely apparent in the picture that little need be said regarding it. Each part has that highest type of beauty—the visible expression of its actual functions. The proportions of the arches are most pleasing; while such less important features as pilasters, railing, and pier coping details have all been adapted to an harmonious design of the whole structure. A 5-light candelabrum is located at each side of each pier and abutment.

Engineering Cost and Data.—The total cost of engineering, inspection and testing was about $7,000, or 2½ per cent of the construction cost—a low rate under any circumstances, and conspicuously low in view of the requirement of great speed with the initial part of the work.

The length of the bridge is 987 ft. Concrete, exclusive of that in the railings totaled 8,100 cu. yd. Reinforcing steel totaled 236 tons. Foundations are on a bed of cemented gravel 13 ft. below low water, but are further supported by 20-ft. piles, 117 of which were used. The arch spans vary from 130 ft. to 150 ft. clear. The spandrels are all gravel-filled, the filling being consolidated under traffic and weather prior to the paving of the surface. The interior surface is all waterproofed and 4-in. cast iron drain pipes are provided at the piers. Spandrel filling totaled 5,300 cu. yd., while the fill at the west approach contains 13,000 cu. yd.

Work was begun in August, 1920, the delay being due to difficulties in selling the bonds. High water prevented much progress prior to May, 1921.

The new bridge was located about 50 ft. north of the older one with resulting advantage of shortened span and improved alignment of approaches. That the length of the new bridge is greater than the length of the old one is due to the fact that a substantially greater river opening was provided for flood conditions.

William J. Titus, Bridge Engineer of the Indiana Highway Department, personally directed the design and the preliminary work. H. A. Hanapel, also of the Highway Department, was Resident Engineer on Construction. Alexander Cross was superintendent for the contractors.

Twenty Thousand Square Yards of Stucco

By John C. O'Rourke*

There has recently been completed in New York City the Fifth Avenue Hospital, embodying the most modern practice in hospital design. It is built in the form of a gigantic "X" so that all rooms will have the maximum of light and air. It is as fireproof a structure as is possible to build.

The exterior walls are of brick covered with stucco, for which our firm had the contract. The amount of wall area to be covered was 20,000 square yards,

which is probably one of the largest single contracts for stucco ever let. As this building faces on Fifth Avenue, it was essential that the stucco show no joining marks whatever. This was accomplished by taking each section between corners at one time, and with a gang of between 60 and 70 plasterers, placing the entire finish coat in one day. By having each plasterer work out from a central spot he met the fresh stucco of the adjoining plasterer with his fresh stucco; therefore, there were no working joints. As soon as one area was covered, the next one was treated in the same way.

Before the work was started, the brick, which had been laid up with raked joints, was thoroughly wet down for twenty-four hours. Each coat of stucco was allowed to set for seven days and then was wet down for twenty-four hours before the next coat was applied.

The first two coats, each consisted of a mix of one part Atlas Portland cement and three parts of ordinary sand, to which was added a water-proofing compound. The finish coat consisted of one part Atlas White Portland cement and one part of white sand, with waterproofiing. While this was still plastic it was given a dash of white marble chips.

The scaffolding was left in place for three weeks and the job then accepted by the architects as being entirely satisfactory, with no joint lines and no cracking. The architects for the building were York & Sawyer, and the general contractor was Marc Eidlitz & Son, Inc.

*T. A. O'Rouke, Inc., New York, N. Y.

Automatic Dump Body

Mandt Automatic Dump Body—is the name of a new booklet recently issued by Mandt Co., Keokuk, Iowa, a 4-page folder, 8½ in. by 11½ in., in two colors. This 4-page folder describes and illustrates the following types of Mandt dump bodies: heavy duty 1½-yd. body, heavy duty 2-yd. body, 1-yd. body for Ford trucks, or other light trucks, gravel or stone spreading body, garbage or grain body, and the hopper type body. Dimensions of and attachments for these different types are all given.

1923 Link-Belt Calendar

For many years the Link-Belt Company has been issuing a large calendar. We are just advised that the 1923 Link-Belt calendar will be ready for distribution early in December, and that a number of extra copies are available. They can be obtained by addressing the Link-Belt Company, 910 South Michigan Avenue, Chicago, on the letterhead of your firm.

The calendar measures 15½"x24" and contains twelve separate full sheets. Each has an attractive illustration of Link-Belt machinery and equipment. Underneath each month's large calendar are shown the previous month and the succeeding month.

An Exceedingly Interesting Account of the Early History

of Quarrying, Tracing Its Development from the Early Days of the Egyptians and Greeks Up to the Present Time*

The effectiveness of any explosive, is largely dependent upon the proper placement of the bore holes, and drilling, therefore, is of great importance. Drilling and blasting are so interdependent that one cannot make a proper plan for placement of drill holes without first considering the grade strength of explosive which the bore holes are to receive.

Where there are numerous open joints the problem of drilling becomes complicated. Fissures in the rock tend to slow down the speed of drilling as well as making it more difficult. Furthermore, an open seam provides an avenue of escape for the gases from the detonated explosive charge, thus reducing the effectiveness of the shot. It is usually advisable to abandon a hole cutting such seams or cavities, as the cost of drilling in unsound rock is thereby increased.

If these joints are irregular and change in direction abruptly, many useless holes may be drilled unless systematic measurements of the joints are made with compass and clinometer and then carefully plotted on paper. Undoubtedly a chart of all the joints containing all the information possible is of great assistance in locating drill holes and avoiding the drilling of useless holes.

Primary and Secondary Blasting

The success or failure of a quarry may be determined by the study and attention given to blasting. Blasting at quarries may be considered under two distinct heads—primary blasting and secondary blasting.

Primary blasting refers to all shots made in the quarry ledge in its original position for the purpose of breaking down portions of the ledge into different sizes. Secondary blasting is that which is necessary to break up the larger rocks obtained from the primary blast into sizes small enough for subsequent handling for loading or crushing.

No problem which the quarryman encounters requires a greater amount of careful study to obtain satisfactory results than does primary blasting. This is due to the many varying conditions encountered in different sections, in different formations at the same quarry and at times irregularities and sudden changes in an individual formation at different points in the same quarry.

The chief variable factors affecting primary blasting are listed by the U. S. Bureau of Mines (Bulletin 160) as follows: (1) Height of face; (2) hardness and uniformity of rock; (3) altitude of beds; (4), prevalence of open bedding seams and points; (5) altitude of quarry floor; (6) size and depth of drill holes; (7) arrangement and spacing of drill holes; (8) number of holes shot at one time; (9) size of charge; (10) posi-

*Paper delivered by N. S. Greensfelder of Hercules Powder Co. at the annual convention of National Crushed Stone Assn.

tion of charges in drill holes; (11) type of explosive used; (12) method of firing shots; (13) method of loading rock; (14) size of crusher. Each of these factors are considered by the careful quarryman in his blasting operations.

Straight Nitroglycerin Dynamite

Nitroglycerin dynamite is the standard by which all high explosives are measured on a weight-for-weight basis, therefore it should contain the actual amount of liquid nitroglycerin designed by its percentage strength. Its high rate of detonation makes it a good explosive to use where a strong shattering effect is desired. It resists water well, a valuable asset where wet holes are encountered.

Extra or ammonia dynamite has the same strength grade-for-grade as straight nitroglycerin dynamite. While its rate of detonation is not quite so high, it is a quick explosive. Its explosive base consists of nitroglycerin and ammonium nitrate. The latter will not resist water very long, but the cartridges of extra dynamite are dipped a second time in paraffin after they have been filled and the ammonium nitrate itself is coated with water-resisting compounds, so they will withstand the cation of water for a considerable time if they are not split in loading. Extra dynamite is not as sensitive to friction or sparks as is straight dynamite.

Gelatin

When a small amount of nitrocotton is dissolved in nitroglycerin it forms a jelly-like substance which is a stronger explosive than pure nitroglycerin. When various absorbent materials are added the result is a plastic explosive densor than ordinary dynamite. Because of this density a given weight of gelatin can be confined in a smaller space than would be required to contain an equal weight of straight nitroglycerin or extra dynamite. This quality makes gelatin a decidedly advantageous explosive to use in hard, tight formations where a concentrated charge at the bottom of detonation, and hence, is less shattering in its effect than straight nitroglycerin dynamite. However, when fired with cordeau, its quickness is increased.

Gelatin, extremely water resisting, is the best explosive to use when the explosive remains under water for a considerable time during loading operations. It is also unexcelled for underground work, because of its plasticity, density, imperviousness to water and good fumes.

Modern Methods of Firing

The introduction of electric blasting caps and cordeau detonating fuse were important contributions to the advancement of quarry blasting. A great increase in efficiency is obtained by firing a number of holes simultaneously over that of firing them individually.

Electric blasting caps furnished the first effective method of simultaneous firing. By placing one or more of these caps in each hole and connecting them all to a power circuit or blasting machine, large numbers of holes may be effectively fired. When this system is employed and there is a high coulmn of explosive in the hole, as in well-drilled holes, it is advisable to place several electric blasting caps at intervals in the charge to prevent the wave of detonation in the explosive from decreasing in velocity as it travels along the charge.

The straight parallel connection is the best for electrical blasting if there is sufficient current and voltage to put the current through the circuit. The reason for this is that some caps are more sensitive than others and in anything but a parallel connection the more sensitive ones may fire first and break the circuit. In the straight parallel connection each cap is independent and should fire regardless of the other caps. The parallel connection can not be used with a blasting machine because of the high current required. When the firing is done from a power circuit with sufficient current the parallel connection is the best.

The next best connection, and one which is good when sufficient current and voltage for the straight parallel connection is not available, is to have the caps connected in groups, and have the caps in each group in parallel and the groups themselves in series. The number of caps and groups is dependent on the available current and voltage. The greater the number of series and the fewer the caps per series, the closer it approaches the straight parallel connection.

However, when a blasting machine is used to fire the blast, the straight series connection should be used because there is not enough current developed to fire a large number of holes, connected in any of the other methods described.

A more recently developed means of detonation is with cordeau. This consists of a carefully drawn lead tube filled with trinitrotoluene. The three principal advantages claimed for cordeau are safety, instantaneous detonation and increased efficiency from the explosive charge.

Cordeau is so insensitive that it cannot be set off by friction, fire or any ordinary shock, but requires for detonation an extremely violent shock, such as that produced by a blasting cap. The average rate of detonation is about 17,500 ft. per sec. Therefore, when it is placed along an explosive charge, the entire column is detonated at a rate equal to that of the cordeau. The increase of the rate of detonation thus óbtained, particularly with the slower dynamites, increases their shattering effect and consequently decreases the cost of secondary blasting.

Where the explosive charge is placed at different points along the hole, cordeau furnishes a particularly convnient and efficient means of detonation. When loading a deep hole with cordeau, run an iron bar through the hole in the center of the spool on which it is wound. Lace the end of the cordeau through a dynamite cartridge, which acts as a weight in lowering the cordeau down to the bottom of the hole. When the dynamite cartridge reaches the bottom, draw the cordeau taut, so that it will lie along the side of the hole and not interfere with further loading. The explosive charge can be broken as many times as desired because the cordeau will detonate throughout the entire length of the hole. The cordeau is then cut off a short distance above the top of the hole, and the end weighted down by a loose stone to hold it taut during the loading.

When all the holes are loaded and the surface cleared for the shot, the main line of cordeau is unreeled across the tops of the holes and the cordeau in each hole is connected to the main line. This is done by slitting the piece of cordeau which extends from the hole and twisting the ends tightly around the main line. When all the holes are connected to the main line a blasting cap or electric blasting cap is connected to the end of the main line. The firing of this cap detonates the entire blast.

Always arrange the main line of the cordeau so that the detonating wave reaches the row of holes next to the face of the quarry first and then the other rows in the order they recede from the face.

It is well, whenever possible, to make a complete circuit of the main line so that every row of holes will have two ways by which the detonating wave can reach it.

Eliminating Vibration

Careful Planning Needed in Building Structures to House Heavy Machinery

By G. W. MAKER, Aberthaw Construction Company

Vibration in multi-story industrial buildings is a subject of prime importance to the designing engineer, particularly in connection with structures which house processes requiring heavy machinery. Where cheap land is available it is possible to use one story-buildings with machine foundations resting directly on the ground, but in congested industrial centers where land is valuable this is not usually practical or economical. In such cases a careful study has to be made of machinery location and layout, as in some types of building a large number of machines placed on the upper floors, and operating at similar speed and in the same line of travel, often causes excessive vibration which not only limits output and qualify but often necessitates a relocation of machinery.

An excellent example of the operation of heavy machinery on an upper floor without appreciable vibration is the recently completed 4-story building for the Rumford Press at Concord, New Hampshire, built by Aberthaw Construction Company of Boston. The structure is of reinforced concrete 80x180 ft., designed to house every operation in the production of large editions of magazines and books. It was believed that vibration caused by the operation of the 26 printing presses would be materially lessened if they were not fastened to the floor and accordingly each one was placed on thin wood skids which rest on the granolithic floor without fastening of any sort.

With every press in operation only a slight vibration is felt in the press-room, while on the floors of the building it is not noticeable. It is a good demonstration of what careful planning and construction can do.

"Hendricks' Commerial Register of the United States"

31st (1923) Edition. Annual. 2482 pages, 8½"x 11½". $15.00. S. E. Hendricks Co., Inc., 70 Fifth Ave., New York.

The above publication is part of the Hendricks Information Service, which latter also includes Hendricks Commercial Bulletin, and the use of the Hendricks Information Bureau. The Bulletin is the monthly supplement to the Register, which keeps the latter up-to-date in many of its details. The Information Bureau obtains special information for subscribers to the Service and undertakes other services which are often of great value to subscribers.

The new 1923 edition of the Register contains 150 pages over and above the 1922 edition. 125,000 changes and additions were made to the new edition.

The lists completely cover the Electrical, Engineering, Machinery, Building, Manufacturing, Chemical and other industries, together with all industries allied thereto. The lists are for the use of both Buyers and Sellers.

Over 18,000 products are separately classified with the name and address following of every manufacturer or producer, together with the trade name or brand (if any) and also essential facts regarding the products of many of the leading firms. These classifications are made of very easy reference by an admirable system of indexing and cross-indexing.

HENDRICKS' COMMERCIAL REGISTER is a widely known and used annual publication which has now reached its 31st annual issue. It is known as "The Original Register."

Orange County Rock & Gravel Co., Orange, California

New Gravel Washing Plant Equipped to Produce Washed and Sized Material

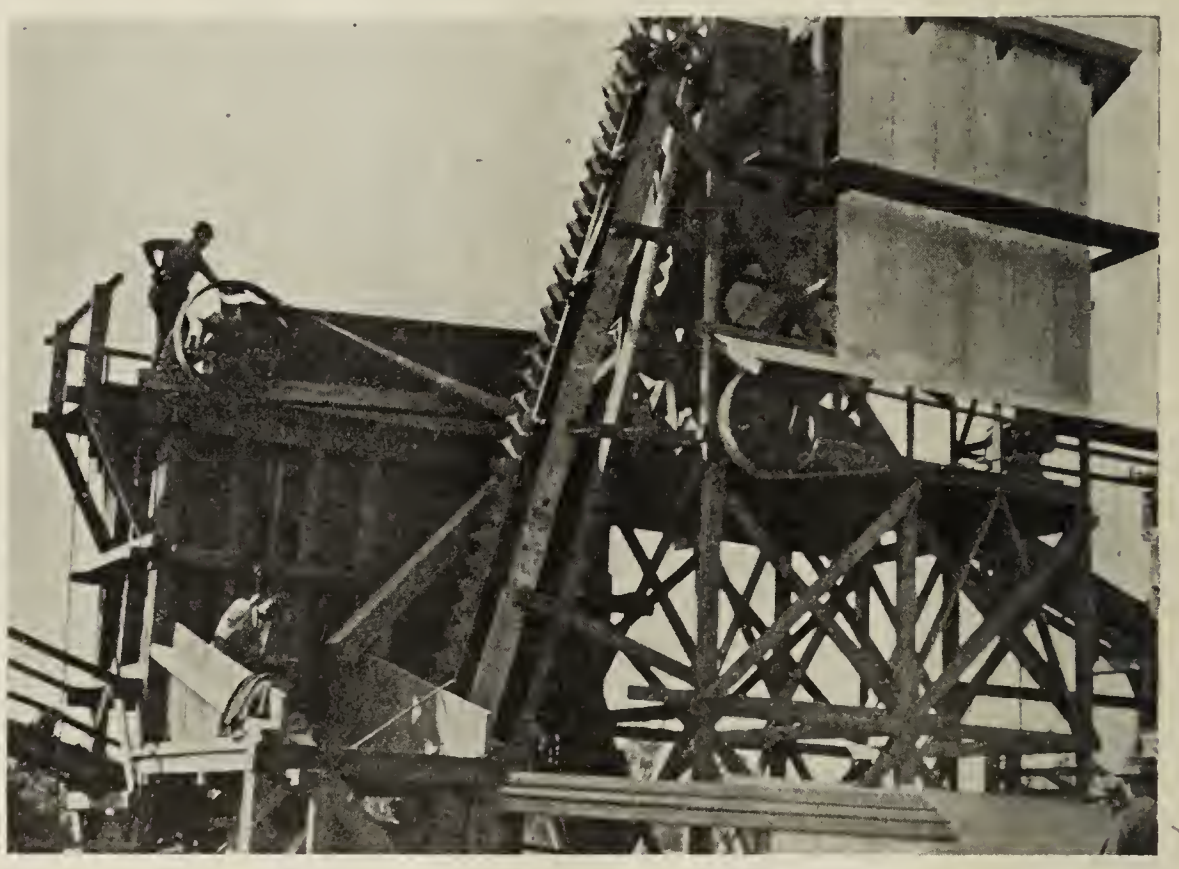
There is an increasing demand for washed and sized gravel and clean, sharp sand for building construction purposes. Correct washing and sizing equipment for the production of sand and gravel to meet the rigid specifications required by contractors.

The progress in the building construction field and the extensive road building program in southern California necessitates not only more sand and gravel but a product of better quality. With the growing demand, new plants have been erected and among the most interesting of these is the Orange County Rock & Gravel Co. plant, which is completely equipped with the most modern and up-to-date machinery. The site is located close to three thriving towns, Santa Ana, Anaheim and Orange. With the local demand from these growing towns and with the road building program in adjacent territory, the market is excellent.

The Orange plant is located along the Santiago Creek, which ordinarily carries but a small volume of water and is shallow except in freshet seasons. Between the banks of the creek there is a deposit of sand and gravel from ten to fifteen feet deep and from 200 ft. to 400 ft. wide. The material is dug with a boom type excavator and loaded into dump cars. The cars are hauled up a 700 ft. inclined timber trestle by a gasoline locomotive to a hopper which feeds a Symons Disc preliminary crusher. The sized material is loaded onto an 18-inch by 75 ft. inclined belt conveyor, which delivers to a 48-inch by 10 ft. scalping screen. All over-size from the scalping screen passes to a small Austin gyratory crusher which crushes to 2 inches and under. The sized material from this crusher is raised by a 12-inch bucket elevator 33 ft. centers to the scalping screen, where it passes on with the other material to an inclined conveyor 18 inches wide by 160 ft. centers. All material reaching this conveyor has previously passed 2¼-inch perforations in the dry process plant.

The conveyor operates on an angle of 20 degrees and elevates the unclassified material to the washing and screening plant. The sizing equipment includes a series of Gilbert Conical Screens 72 inches in

General view of the washing and screening plant.



The bucket elevator raises crushed material to the scalping screen.

Another view showing two belt conveyors, one delivering to the dry-screening plant and the other to the washing plant.

diameter. Each screen is fitted with perforated plate for classifying material into the following grades, 1¼ inches to 2 inches, ⅝ inches to 1¼ inches, ¼ inch to ⅝ inch, ¼ inch and under. Each different size is dropped into storage bins below. The sand separation is accomplished with two 16-inch screw type log washers.

The operation of the log washers is unique. In place of running a separate stream of water and sand to each unit from the last screen, the whole stream passes through the first washer and the overflow to the second unit. In this way two grades of sand are secured. Due to the velocity of the water, the product of the second machine is very fine. The bin below the log washer is divided into two separate compartments so that either size sand can be drawn or a mixture as desired.

The bins under the screens extend to the ground. Quadrant bin gates are mounted at the sides of these bins for delivery to two 24-inch belt conveyors. These conveyors are on a slight incline and serve two purposes. First, they allow the gates to be placed at a low point, making it possible to more nearly clear the bins of their entire contents. In the second place, they permit of the opening of two or three gates at a time when a car of mixed product is desired. This allows the company to place on the job a load of accurately mixed material. The conveyor on one side of the bin is used for loading automobile trucks, while the conveyor on the other side is used exclusively for loading railroad cars. This makes a very practical arrangement and allows the operator to load both cars and trucks at the same time without interference.

The design and details for this plant were prepared by the Stephens-Adamson Mfg. Co. through their engineers in Los Angeles, and all the conveying, elevating and screening machinery was furnished by this Western company. The crushing machinery, dump cars and Orton Steinbrenner crane equipment was furnished by the Brown-Bevis Company of Los Angeles.

The Orange County Rock & Gravel Co., headed by Mr. H. G. Wright, are enthusiastic concerning their new plant and although they are producing 1,000 yards per day at the present time, it is impossible to supply the demand.

All the belt conveyors are completely equipped with ball bearing carriers.

Blaster's Handbook

A new and revised edition of the Blaster's Handbook, in attractive form, has just been issued by E. I. du Pont de Nemours & Company, Wilmington, Del. It was compiled under the direction of the manager of the company's technical section, and is especially valuable at this time to all users of explosives because it reviews blasting practice in every phase and gives the most approved methods of employing dynamite and black powder based on actual field use.

The book is profusely illustrated, showing proper methods of employing explosives under a great many different conditions. Instructions are given on firing; how to handle a misfire; how to use explosives in road and railroad building; side hill cuts; digging trenches; scrapping heavy machinery; blasting old foundations; and all kinds of quarry, mine and farm use. The subject of the use of explosives in agriculture is thoroughly discussed. How to handle and store them most efficiently is also pointed out.

The book is gotten up in compact, convenient, and permanent form, and is very well arranged.

Decorative Value of Stucco

By H. C. Bishop*

The decorative value of White Cement color aggregate stucco is thoroughly demonstrated in the construction of the new High and Grade School Building at Humboldt, Iowa.

Appreciating fully the advantages and possibilities of this type of construction, Mr. G. L. Lockhart, Architect of St. Paul, Minnesota, designed this attractive school building which was constructed during the building season of 1921.

Stucco work was done by Thomas MacDonald, plastering contractor of Minneapolis. The marble chips were supplied by the Drake Marble and Tile Company of Minneapolis, and the white sand was furnished by the Minnesota White Sand Company of Mankato, Minnesota.

The walls were of 12 inch hollow tile construction, which we are satisfied produce an excellent base for Portland cement stucco. After thoroughly wetting the tile, the scratch coat was applied in the usual way made of one part cement and two parts of well graded, sharp washed sand. After the scratch coat had been applied over the entire building, it was allowed to become thoroughly dry. Just prior to applying the second coat, to prevent any possible suction, the scratch coat was thoroughly soaked with water and to this was applied the finish coat consisting of one sack of cement, two sacks of white cement, four sacks of white sand, two sacks of well graded, sharp washed sand, one-tenth part of hydrated lime and one pound of waterproofing.

The finish coat was applied to a thickness of 3/8 inch and brought to a true surface. In order to obtain the best job and to uniformly cast on the color aggregate, it was necessary for the man doing the dashing of the color aggregate to follow very closely the man applying the finish coat, working both scaffolds at once; this avoided any marked irregularities in the dashing and produced a uniform distribution of the color aggregate.

The marble chips were sized ¼ inch and under; mixed five parts Tioga water, two parts Swanton black, one-half part green and one-half part Kasota brown.

As you will note from the above description, this work contains but two coats, which by applying 3/8 inch for the finish coat, was deemed sufficient to prevent any possibility of the tile joints becoming visible through the stucco.

*Sec'y. Madsen Construction Co., Minneapolis

Rubber Belts for Heavy-Duty Service

During the past year the Cincinnati Rubber Mfg. Co., Cincinnati, Ohio, has built a 55x260-ft. addition to its plant and increased another part three stories, the addition giving a 200 per cent increased capacity.

The company is producing for the sand and gravel, crushed stone, lime and cement industries the Peacemaker friction surface belt for transmission and heavy-duty service and extra cover conveyor belts, the Hontas, Arno and Peacemaker. This company also makes Shadow sand suction hose and Arno dredge sleeves.

Stock Houses for Cement Plants

By V. E. Forrest, Chief Engineer Bland Engineering Co., Minneapolis.

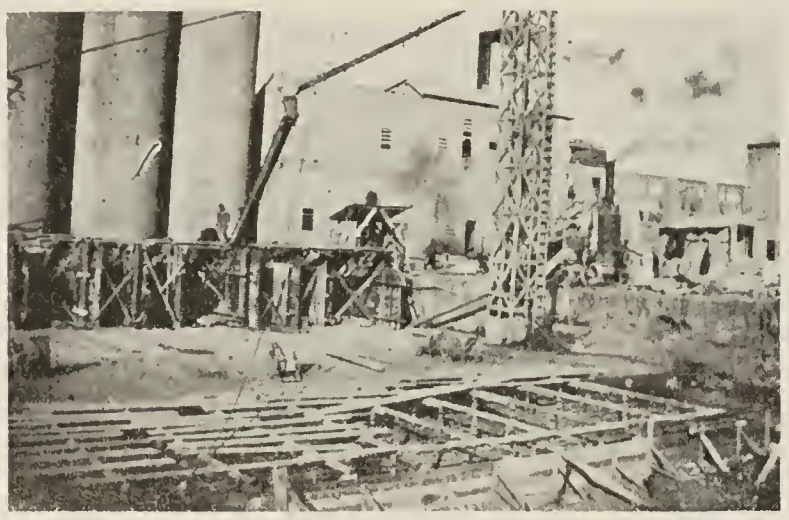
During the early history of the cement industry, the matter of storing and shipping was simple. Mill capacities were small, and the cement was simply run into a large wooden bin. For packing it was shoveled by hand into barrels or bags and weighed by hand.

Manufacturing processes developed very rapidly, and it has been common experience for plants to be rearranged, and expensive machinery junked and replaced

Breaking ground for a new stock house.

by other expensive equipment, in order to reduce production cost. The same is true of the packing system which has become a remarkably efficient and economical process, through the energy of manufacturers of packing machinery.

Stockhouse plans, however, progressed very haphazardly, and, with a few isolated exceptions, the ordinary stockhouse, even today, consists merely of a single large bin, or a number of bins arranged in aisles, with very inadequate handling equipment. Where conveyers are used, the cement commonly has to be dragged to them by hand with large hoes, or with power scrapers, and the system involves a high labor cost, which can be almost com-



Pouring main footing slab and foundation walls. The slab is 28 inches thick, heavily reinforced.

pletely eliminated by the use of a well planned stockhouse with proper equipment.

Experience has clearly shown that for storage of this kind circular tanks of reinforced concrete prove the most satisfactory, economical and permanent. Loss through leakage is entirely eliminated, as also is the fire hazard; flexibility of construction is introduced; additional bins can readily be added as requirements may demand, and the buildings lend themselves to the adoption of the most economical handling equipment.

The stockhouse should be planned practically as a self-operating unit, and as the packhouse and baghouse are essentially a part of the stockhouse system, they should be incorporated in the same design. At the present time, more labor is wasted in some plants in handling and rehandling bags than is required in a well organized plant for the entire handling of cement from the finish mill, through the stockhouse and packhouse, to the cars.

Coming from the finish mill, the cement is fed by conveyers to the stockhouse elevators, and distributed to the bins by conveyers. Below the bins are tunnels containing conveyers, by means of which the material is withdrawn from the bins to the packhouse elevators.

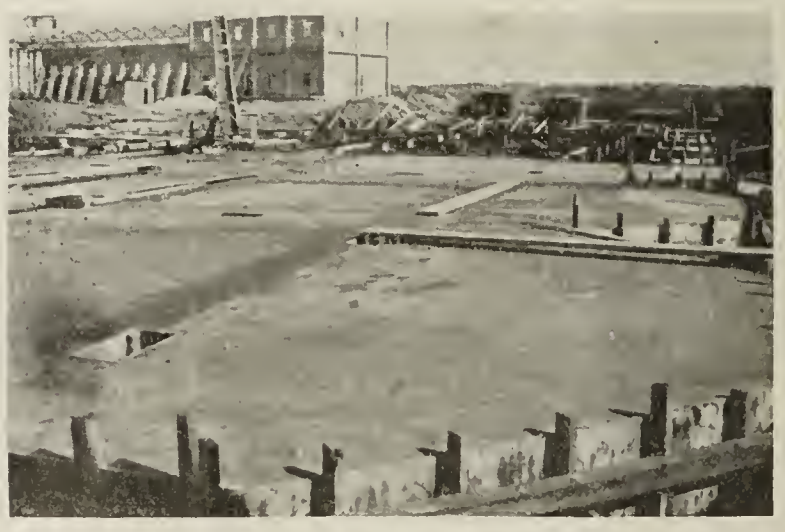
The packhouse foreman attends to the opening of the proper gates for distributing and reclaiming the material, and operates the starters of the motors which drive the elevators and conveyers. Otherwise no labor is involved in connection with the storage bins, save the regular oiling and inspection trips made by the finish mill oiler.

To render the headhouse easy of access, a manlift is installed in the machinery well. This is a simple and inexpensive article, requiring no power connections. The cab is attached by means of a steel cable to a balance weight, balanced approximately to the weight of the cab

Ready to pour the main bin slab. Note the boxes for draw-off openings, and conduits for electric light and power wires.

and operator. The sheave over which the cable runs has roller bearings, so that there is little friction, and a slight pull on the hand rope, which is of soft cotton, takes the operator either up or down. Safety brakes operate automatically in case of accident, and give perfect protection. Steel ladders or stairs are also installed.

Another simple device of value is the electric tell tale, installed at the far end of the conveyer in the upper gallery, which, when the conveyer is operating, continually flashes an electric lamp in the finish mill. In case of the conveyer failing to operate for any reason, instantaneous warning is given, and the elevator feed can be shut off before any damage is done by clogging.



Main slab poured. Beneath this slab are the tunnels for the conveyors to remove cement from the bins.

Bin forms. This stock house consists of 24 silos which with the interstice bins make 39 bins.

The Pack House

In the packhouse, as it exists at present in most cement mills, we find one of the greatest contrasts to be found in any manufacturing industry. On the one hand there is the packing machinery, developed to a remarkable degree of perfection, and, on the other hand, working conditions so dirty, uncomfortable and unhealthy, that it is hardly possible to keep a force at work.

The reason is simple, and the situation avoidable. The packing machines have ordinarily been installed in old buildings, originally built for other purposes, or in a shed built at the end or side of a stockhouse without regard

View on top of forms. Wooden yokes lift the forms. The yokes are raised by hollow jack screws which climb the reinforcing bars.

to efficient planning. The installation has been made to fit the buildings, instead of the buildings being arranged to suit the machinery, and allow of arrangements that would decrease packing costs. Most packhouses are situated between buildings, or surrounded by box cars so that proper ventilation is impossible. Elevators, conveyers and screens are nowhere near dust proof, bags are carried by hand, and there is spillage everywhere. It is one of the hottest, dustiest and most disagreeable places to work on the face of the earth, and it is no wonder that it is hard to keep men there.

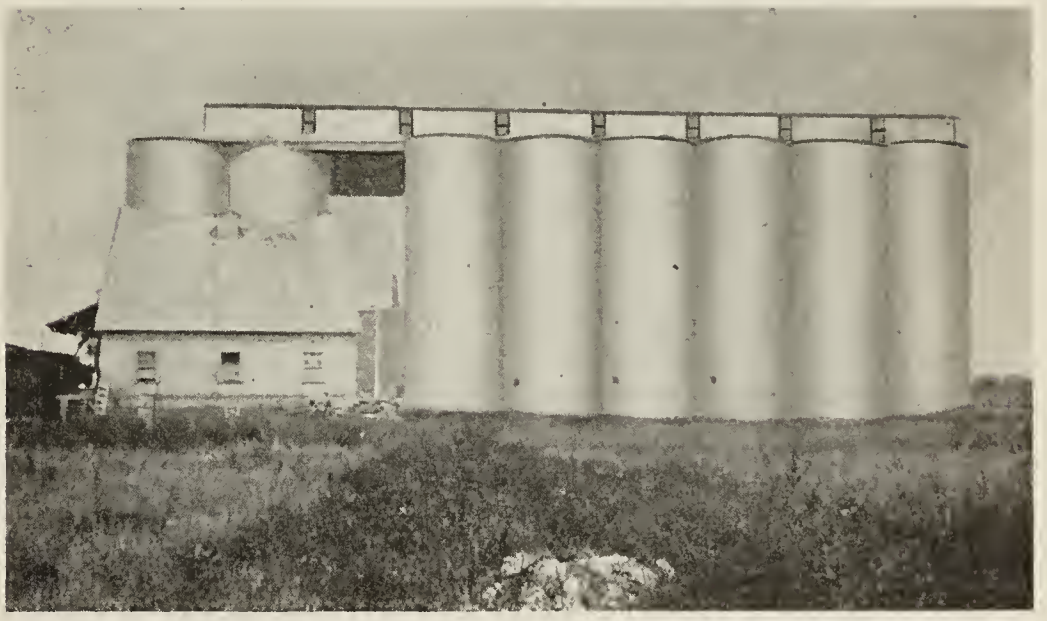
Why build them that way? Why not do a little careful planning and give the same thought to the comfort of the men that is given elsewhere in the mill? The stockholders may say that a packhouse does not pay dividends, but it will pay dividends in the greater efficiency of the men, in avoidance of waste, and in holding the force at work at rush periods.

If a performance curve were drawn, it would show that packing is highly seasonable, and subject to the greatest of peak loads. The greatest demand is in the summer months, and shipments are often held up by damp or rainy days, to be followed by rush shipments shortly afterwards. The packers loaf for a few days, and then have to work at highest possible speed to care for the peak load. That is when proper packhouse construction pays its dividends. It speeds up shipments when speed is required. The men will work better and faster in a well lighted, well ventilated room, comparatively free from dust, and they will stay on the job.

Such a packhouse is not difficult of construction. The packing machines are placed above the height of the box cars to give adequate ventilation. Machinery is made as nearly dust proof as possible; spill from machines drops into dust proof bins and is conveyed back to the elevators; bags are chuted direct to the packers from the baghouse, and the filled bags are chuted from the packers to the cars. Instead of the men wading in loose cement on the floor, amid clouds of dust, the packhouse can be kept celan and comfortable, and therefore a desirable place to work.

The Bag House

Regarding the bags, the president of one of the largest cement companies recently said: "When we built our mills, we did not even think of bags," and the same is evidently true of most of the cement mills in the country. Yet the bags are there to be cared for; they occupy a lot of space, and they represent a considerable investment. They have to be taken from the cars, counted, sorted, cleaned, repaired, tied, stored and delivered to the packers. There are plants where this



The completed stockhouse showing gallery connection with former stockhouse. The tunnels are also connected.

work consumes as much labor as is required for the entire operation of a well organized stockhouse, packhouse and baghouse.

Manufacturing cost is watched as closely in cement mills as in any industry—more closely than in most. Yet it would seem as if the cost system ended when the cement reaches the stockhouse. No wonder the stockholders say the stockhouse, packhouse and baghouse do not produce dividends. They don't! But they should.

Bin walls at a height of 20 feet. The entire building is housed for six feet below forms, on account of winter construction.

The dividends that result from the elimination of waste are just as valuable as those that come through reduction of manufacturing cost.

In a properly designed baghouse, the bags are received from the box cars or trucks as the case may be, and

Ready to pour the slab above the bins. The slab forms the conveyor gallery floor.

placed in "Returned Bag Storage." Lots are placed in individuald compartments of the bag cleaner, then sorted and counted. Damaged bags are sent to the repair department, and usable bags are sent directly to the tying department, then to storage, and from storage are chuted

Bin walls at a height of fifty feet. Concrete is pourned night and day, the forms being raised continuously.

directly to the packing machines, delivered at the elbow of the packer.

Throughout these operations hand labor is avoided as far as possible. The most efficient plants are arranged vertically; that is, bags are sent to the top of the plant, and are worked downward, all transferring being done by gravity, and the labor of loading, unloading and wheeling trucks is eliminated. In this way also, bags are kept always in their proper place, instead of being strewn over the packhouse, and the handling of the bags never interferes with any other operations in the plant.

New Book

Kidder's Architects' and Builders' Handbook, by Frank E. Kidder and Thomas Nolan, M. S., editor-in-chief. Seventh edition; 1907 pps. 4 1/4 by 7 ins.; profusely illustrated. Published by John Wiley & Sons, Inc. For sale by CEMENT AND ENGINEERING NEWS, 22 Quincy St., Chicago. Price $7.

With this edition the entire work has been revised, some new chapters added and a new index made. The latest data on building construction and equipment have been added and all up-to-date types of construction have been illustrated. All tables have been revised.

Rudolph P. Miller, superintendent of buildings, Borough of Manhattan, New York City, has rewritten the two chapters on fireproofing of buildings and reinforced concrete.

In Part III the Sections on heating and ventilation and chimneys have been entirely rewritten by L. A. Harding, formerly professor of mechanical engineering at Pennsylvania State College and of experimental mechanical engineering at the University of Illinois, and include very numerous practical examples of everyday problems, worked out in complete detail.

New matter has been included covering: New data on building laws relating to loads on masonry; graphical method of determining the center of gravity of plane figures or sections; graphical method of determining moments of inertia of plane figures; triangular loading of beams; end-connections of tension-members; new wire-data; new matter on gages and chains; graphical method of determining the deflection of beams; angles used as beams; secondary stresses in truss-members; new data on tanks and stresses in cylindrical tanks, etc.

Cordeau-Bickford

A perfect detonator has been defined as one that would be safe and easy to handle, waterproof, and would explode a charge throughout its entire length and in any number of places instantaneously.

Cordeau-Bickford is a detonating safety fuse consisting of a lead tube filled with trinitrotoluene, which has been manufactured by the Ensign-Bickford Co. during the past 7 years and is being sold by the various powder companies. This type of detonator has come as near as anything yet produced to meeting the requirements given in the first paragraph. Cordeau-Bickford is not sensitive to shock or friction, and there is no danger, therefore, of a premature explosion being caused by it during the loading operations. Evidence of the safeness of Cordeau is given by the fact that no premature explosions have ever been due to Cordeau.

Men who have used both the electrical and Cordeau methods of setting off a number of charged well drill holes state that the blast can be loaded in one-third less time when the Cordeau is used and the connections can be made in one-half the time that is required when electric exploders are used. This saving in time makes Cordeau economical to handle, and as it extends from the top to the bottom of the drill hole, its use is particularly advantageous where the charges are broken by tamping. The lead covering makes Cordeau-Bickford waterproof.

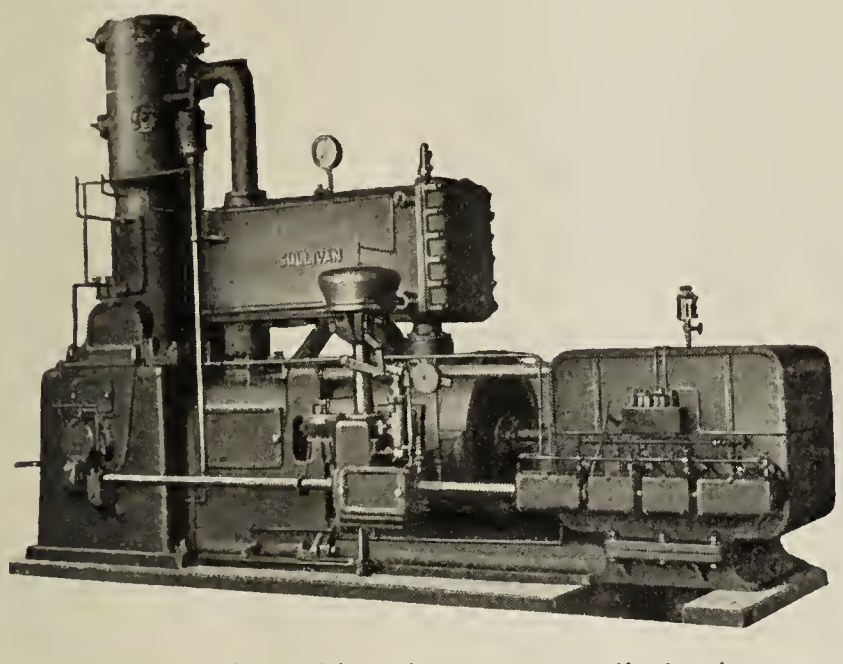
Cordeau-Bickford extending from the top to the bottom of the well drill hole gives the entire charge of explosive complete detonation. Investigation of the quarry face after a blast where exploders have been used will show a greater fracture of the stone at the places in the charge where exploders were placed which shows that a better breaking of the stone would result with an equal detonation given throughout the entire column of explosive.

The rate of detonation of Cordeau is approximately 17,500 ft. per second, so that instantaneous detonation of a number of quite widely separated charges of explosive can be accomplished.

The initial cost of Cordeau is higher than the cost of exploders would be to set off a series of charged holes, but, as Cordeau more completely detonates the explosive charge than exploders less secondary shooting is required. Because of this fact, and the fact that it is safe and easy to handle, the use of Cordeau-Bickford is becoming general in operations where the well drill method of blasting or the tunnel and pocket method is being used.

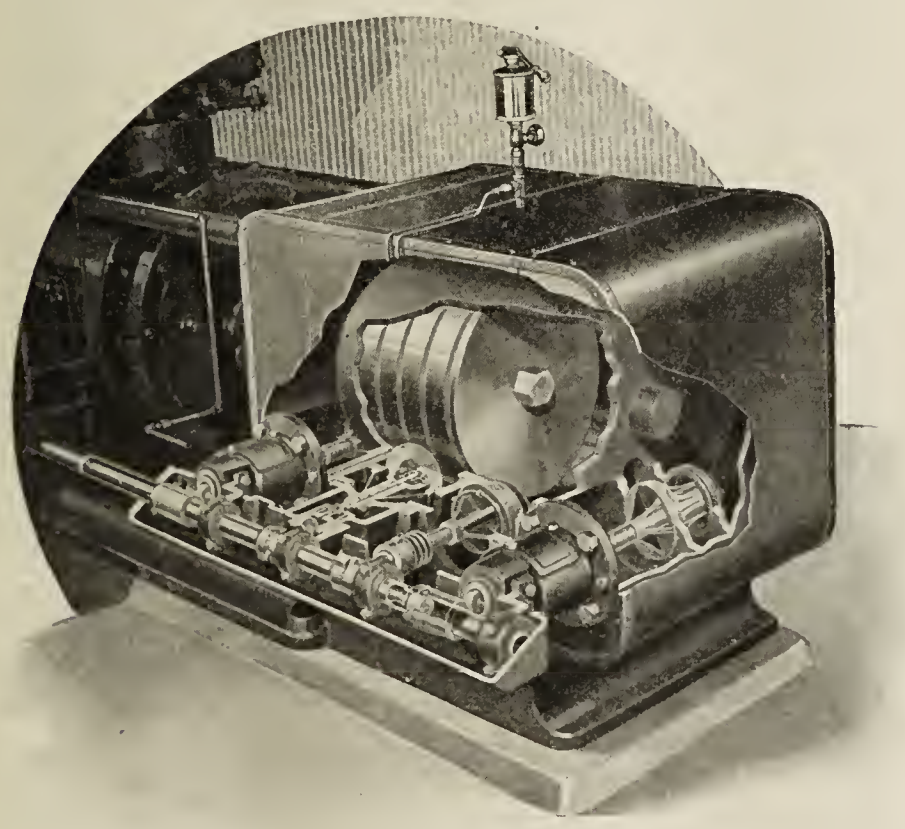
Angle Compound Steam Driven Air Compressor

A new steam-driven, angle compound air compressor is announced by the Sullivan Machinery Co., 418 Gas Bldg., Chicago. It consists of a two-stage compressor having its low-pressure cylinder in a horizontal plane and its high-pressure cylinder in a vertical plane. Power is



furnished by a single-high-duty steam sylinder in rear of and tandem with the low pressure air cylinder. As shown in the accompanying drawing, a single crank pin drives both low and high-pressure pistons. The steam and exhaust valves are of the Sullivan wafer type, consisting of flat rings of thin tempered alloy steel. On both high and low-pressure air cylinders the inlet and discharge valves are of an improved type and arrangement, known as the Sullivan double wafer valve. For removing the heat of compression in the air from the low-pressure cylinder an intercooler is provided, consisting of a cylindrical cast- iron shell containing a nest of copper or aluminum tubes through which cooling water circulates.

Heretofore, the company points out, its angle compound design of compressor has been belt-driven or direct-connected. The new compressor, however, is operated by a single four-valve direct-flow steam cylinder connected in tandem with the low-pressure or horizontal cylinder of the angle compound unit. The capacity range of the machine is from 1,000 to 3,500 cu. ft. of free air per minute.



Sullivan Direct-flow steam cylinder with walls cut away to show valves and piston.

For Light Material Handling

For light material-handling, such as excavating gravel for road-building, digging marl, handling sand at concrete products plants, and so forth, Sauerman Bros. announce a new model cableway with gasoline or belt drive hoist mounted on road wheels.

The new machine is called the Sauerman "Junior" Cableway and is manufactured in three sizes, with 6 cu.

A Sauerman "Junior" cableway opening up an abandoned pit which had been worked down to the waterline with teams.

ft., 9 cu. ft., and 13 cu. ft. buckets. All have operating spans of 300 ft.

While the new machines are low in cost, they are said to be equal to the standard Sauerman Dragline Cableway Excavators in design and construction, only they are lighter and semi-portable.

Complete information on the "Junior" cableways, including specifications, is given in Bulletin No. 123 just issued by Sauerman Bros., 462 S. Clinton St., Chicago, who will send copies free to all who so request.

Link-Belt's New Catalog

The Link-Belt Company of Chicago, Philadelphia and Indianapolis announces the completion of a new General Catalog No. 400 which embraces their entire line. It is the most complete book they have ever issued on this subject. It contains 832 pages, is cloth bound, and can be otbained from any Link-Belt branch office.

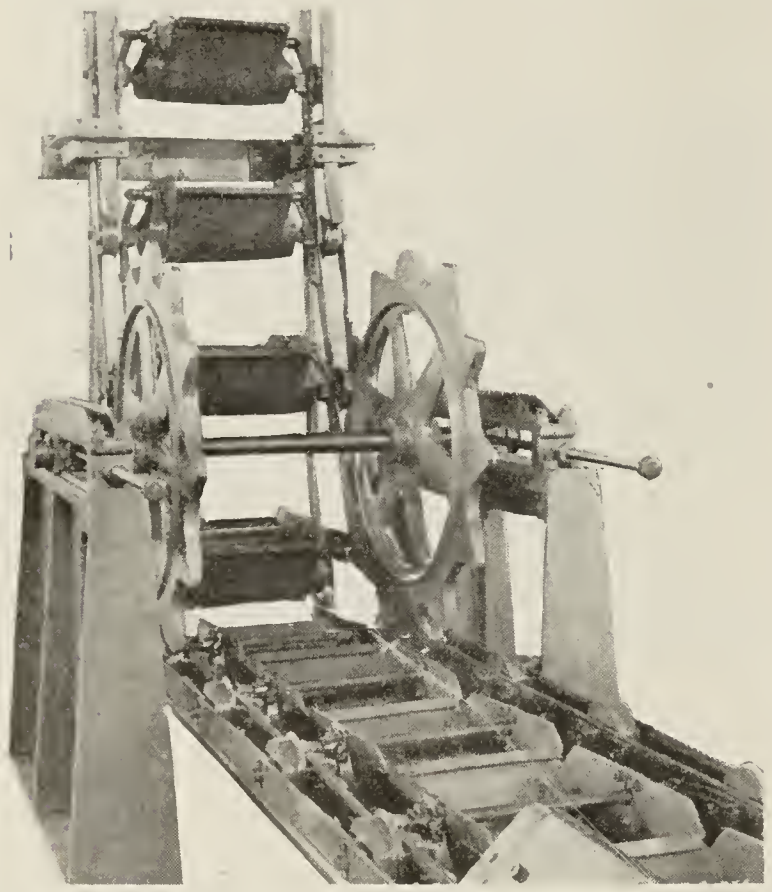
This catalog not only includes the complete Link-Belt line, but also the products of the H. W. Caldwell & Son Company plant of that Company. It contains, in summary, the following: Link-Belt Chains, Power Transmission Machinery, Various Types of Conveyors, Boiler Plant Equipment, Coal Tipple Equipment, Car Loaders and Unloaders, Locomotive and Crawler Type Cranes, Electric Hoists, Overhead Cranes, Car Pullers, Friction Hoists, Power Hoes, Sand and Gravel Washing Equipment, and Various Kinds of Lime Handling Equipment. Catalog may be obtained from the Link-Belt Co., 910 South Michigan Boulevard, Chicago, Illinois.

Pivoted Bucket System of Handling Materials

In cement plants the pivoted bucket system of handling coal, rock, shale, and clinker has been regarded as most practical and economical. For more than 25 years this bucket has been justifying its existence in delivering material to grinders and bins.

Of the several types of conveyors now in use each has its advantages. In the new pivoted bucket carrier, claims the maker, the Chain Belt Co., Milwaukee, these features are combined, as well as having further refinements of design to give smoother operation and longer life.

Among the more important features are rigid through-rod bucket supports combined with cantilever suspension, easy removal of bucket and chain parts without disturbing the rest of the equipment, special facilities for lubricating the wearing parts, and a steel



Loosely suspended carrier with buckets about to enter lower horizontal run. The buckets nest themselves in the overlapped position without lap-adjusting device.

chain with case-hardened pins and bushings and white iron rollers; the steel chain eliminates the defects and inaccuracies inherent in castings.

The most important feature is the combination of rigid through-rod construction with the cantilever principle of bucket suspension, as shown in one of the illustrations. Through this combination the chain load is concentrated at the chain-roller centers and the possibility of the chains tilting inward is practically eliminated; therefore there is no unnatural wear on the chains and the carrier operation is smoother. To assure absolute rigidity the through-rod is turned down on each end and hot-riveted to the drop forged steel cantilever side arms. The turned-down ends are sufficiently long to provide rigidity when riveted into place. The centilever arms are assembled to the chain by means of a bolt together with a heavy chain pin, tapered on one end to give it a tight wedge fit in the side arm. This pin also has generous bearing length to prevent all play. A ⅞-in. hexagon nut holds the pin, and a special locking plate gripped by four lugs on the side-arm hub prevents the nut from turning.

The general scheme of construction is shown in the illustrations, where there is seen a loosely suspended carrier with the buckets approximating the positions assumed when moving downward and about to enter the horizontal run; also the freedom with which the buckets nest in the overlapped position. There is no awkward interference, no lap adjusting devices are needed, and the overlapping lips drops into position automatically. In tripping, the bucket is held for several seconds to allow sluggish material ample time to discharge.

Although the rigid through-rod cantilever construction eliminates most of the unnatural wear on the chain rollers, normal rubbing wear is also minimized by white iron rollers. Special tool steel is used to bore the chain rollers on this new carrier. As pivoted bucket carriers are usually used with coarse and abraisive materials, the importance of this wear-resisting roller is readily apparent. The cutaway design at at the top of the malleable iron bucket makes it possible to remove the bucket from the through-rod without dissembling the chain.

Sand and Gravel Pumps of Dependability

The "Lightning" sand and gravel centrifugal pump manufactured by the Kansas City Hay Press & Tractor Co., Kansas City, Mo., is equipped with two side plates, one for the suction side and one for the hub side, permitting the pump to be used for either right or left discharge. The shell is not drilled and tapped for stud-bolts, but instead, a flange with slots is provided for the bolts which fasten the side plates to the shell. This feature eliminates the trouble which is experienced due to the breaking of the stud-bolts, and when sand has cut the bolts out it permits the removal and replacement of the side plate much more easily and quickly. Moreover, an air-tight joint is obtained by virtue of the fact that the gaskets are solid rings, without the perforations required when stud-bolts are used in the shell.

The hub side plate is so designed that practically no sand can enter the hub bearing, thereby preventing excessive wear on both the shaft and the bearing, usually a source of constant trouble, as every pump operator knows. The hub is so designed that the bearing is placed close to the runner; the distance from the center of the hub-bearing to the center of the runner is, therefore, very materially reduced. This means better balancing when the runner operates at high speed, less vibration of the pump when under a heavy load, and far less likelihood of breaking the shaft.

The runner is equipped with renewable shoes, is free from hubs on both sides and is designed to fill the shell completely. Greater efficiency results and the pump operates more smoothly.

The shaft and runner can be removed without disturbing the suction side plate and suction pipe. This is due to the fact that the hub side plate is removable, a practical advantage which every pump user will be quick to appreciate.

Full details of the Lightning Sand and Gravel Pumps may be obtained by writing the Kansas City Hay Press & Tractor Co., who have thousands of these pumps in successful operation, which is a striking endorsement of their dependability.

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"The proof is in the buying"

You would probably use an explosive that gave you one-third more sticks per dollar, if you knew of the many others in your line of work who will now use nothing else.

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News of the Cement Mills

At the plant of the Bonner Portland Cement Co., Bonner Springs, Kansas, they operate 30-inch Griffin mills in preparing the material for the kilns, which are followed by 8 by 22 tube mills. The dry process is used. They have two kilns 8 by 120 ft. The clinker from these kilns is first fed to eight Griffin mills after which it passes to one 8 by 22 ft. tube mill. In final grinding they employ eleven 30 inch Griffin mills, one 40 inch Griffin mill and one 7 by 18 ft. tube mill.

In the final grinding department of the plant of the Cape Girardeau Portland Cement Co., Cape Girardeau, Mo., they have five 40 inch Giant Griffin mills which effect the preliminary grind and final grind is done with three 6 by 16 ft. Bonnot tube mills, each loaded with 11 tons of 7/8-in. cast iron balls.

Material is carried from storage to raw grinders by screw conveyor and clinker is handled by electric traveling crane and screw conveyor.

They burn Southern Illinois screenings, which is reduced to powdered coal in four 30-in. Griffin mills. In power plant we have one 150-kw. and one 1250-kw. steam turbines, four 273-hp. hand fired boilers and two 705-hp. waste heat boilers.

The annual capacity of the plant is 500,000. They are equipped to ship bulk cement, which they load into cars through flexible spout and take railroad weights on such shipment. Shipped five cars of bulk cement last year.

During the past year they installed two 705-hp. waste heat boilers and economizers, using all heat from kilns. Also, five 40-in. Griffin mills, which were used to replace obsolete equipment in clinker mill.

The Birmingham, Alabama, steel and iron industry is built on the proximity of raw materials. This truism has never been quite so forcefully brought home as during the mine and rail strikes which caused steel mills and furnaces in the east to cease production while production here has gone straight ahead in the iron and steel-making mills, and consuming plants depending on them, have also maintained full or nearly full operations.

Limestone, which is one of the three materials entering into iron and steel making, has developed another large industry here. The Phoenix Portland Cement Co., Nazareth, Pa., is building a 1,500-000-barrel Portland cement plant at a cost of more than $2,500,000 on a 80-acre tract of land near the by-product plant of the Sloss-Sheffield company. Diamond drills have shown that deposits of limestone on this acreage running to a depth of 200 feet will furnish material for the production of more than 200,000,000 barrels of cement of first-grade quality. The estimated depth of this deposit is 2,100 feet.

This industry will have its raw materials alongside its plant and the leading trunk lines entering the district run by the property. It is not to be wondered at that the Phoenix company has followed the example of the Atlas company in securing a Birmingham foothold.—Birmingham Tribune.

Walter J. Maytham, chief consulting engineer of the Northwestern States Portland Cement Company was the guest of honor recently at a farewell banquet tendered him by his friends and associates at the Northwestern cement plant. He leaves shortly for Denver, Colo., where he will make his future home.

Mr. Maytham has accepted the position of general manager of the Cement Securities Company, a position which puts him in charge of eight cement plants in Colorado, Montana, Oklahoma, Utah and Nebraska, having a personnel of over 2,000 men. He will be responsible for the production and upkeep of the plants and in this work he stated he had been assured a free hand. The holdings of the company are valued at over $25,000,000, it is said.

The Northwestern Portland Cement plant was designed by Mr. Maytham and he superintended the construction work. When operations were started he assumed the position of consulting engineer, and in his new work will retain that relation to the plant at Mason City, Iowa.

That he is widely known in the cement world is evidenced by the fact that he has been called in on consulting work both as to new plants and plants already in operation all over the United States and in Canada. He spent two months in Mexico at one time and has been offered positions in all parts of the world. Recently he refused an offer to become manager of a cement plant in India. This is the fourth offer he has had from that country.

The banquet was a total surprise to the guest of honor, who was deeply toucned by the thoughtfulness of the men, many of whom he had been associated with in the cement business over 20 years. Officers of the plant were asked to be present as guests in honor to Mr. Maytham, Mr. McNider, president of the company, having been chosen to present as the gift of the men of the plant, a handsome engraved gold fountain pen.

Mrs. Maytham, who is now in Detroit, where their home is, (113 Collingwood Ave.) will go west and join Mr. Maytham when he has obtained suitable quarters.

Within the next few weeks the once mammoth plant of the Sandusky Portland Cement Co., at Syracuse, Indiana, will be a thing of the past. A force of men has been at work for several weeks past razing the plant.

Part of the machinery is being shipped to their new plant at Silica, Ohio, near Toledo.

The railroad equipment used by the company at Syracuse for a number of years is being shipped to Toledo, O.

The company began making marl contracts at Syracuse in 1897 and in 1900 the first cement was produced under the management of Charles Reilly, who was superintendent. This was one of the pioneer cement producing plants of the middle west.

The plant did a thriving business for a number of years, but ceased operation in 1919, largely because the marl deposit gave out, and because the company was stopped from dredging in Lake Wawasee.

The company is now disposing of its real estate at Syracuse and buildings that are not being razed.

Cement and Engineering News

Vol. 35 Chicago, MARCH, 1923 No. 3

Prosperity Is in the Offing

Order Takers May Not Prosper But Real Opportunity Knocks at the Industry's Door—Salesmen Face a Pleasing Prospect.

The commercial inter-dependency of the various industries is well established and recognized by all who are at all familiar with modern business. No one enterprise can thrive except as related ventures thrive, even as is the prosperity of each member of a private family dependent to a certain extent upon that of the others.

Cement is no exception. Rather, it is dependent on other enterprise more than is the average industry, for prosperity in the cement industry is vitally dependent on the freedom of supply and reasonableness and stability of price of raw materials on the one end, and activity in the various phases of construction activity which consume the finished product on the other. The coming season holds fair promise, in all particulars.

Considering markets first, cement would seem to be exceedingly well favored. It is the one basic element entering into all construction. All building, whether it be a $1,500 cottage in a village, or a $100,000,000 engineering project in a desert, contemplates the use of more or less of this material. A national housing shortage is in full course of correction, involving the erection of thousands of habitations. Every metropolitan area has an enormous office and industrial building program under way. The greatest road building program of all history is just now in full blast. All these propositions call for cement, and more cement. Thus markets seem assured.

A limiting factor in production, at various times in the past, has been coal, of which vast quantities are required. It is estimated that 10,000,000 tons of coal were used in cement processes during the calendar year just passed, when many plants were forced to close for lack of fuel. A careful survey of the field would seem to indicate that coal will be ample in supply and reasonable in price during the current year.

A peace has just been negotiated in the unionized bituminous producing fields which guarantees no widespread cessation of work due to labor disturbances. The mines of America, when unhampered by labor troubles, are easily able to produce from fifty to seventy per cent more coal than the nation can consume. Such being the case, it would appear that all the fuel that the cement mills can require will be speedily forthcoming.

With regard to price, the freedom of supply will regulate that. When supplies in any commodity are very far in excess of demand, the price of that commodity naturally fails to a point regulated by the production cost of that commodity. For some years past a reverse situation has existed in coal. Supplies have been far short of needs and the natural result, a market at all times under the control of the seller, has been the result. This meant high priced coal, in addition to scarce coal. When supply exceeds demand, a buyer's market exists, in which the consumer may fill his desires, within certain limitations, at his own price.

The latter condition is the one that, from all indications, is the one approaching. The non-union coal producers are already talking of cutting costs of production, in order to be able to cut selling prices and thereby get a greater proportion of the business than has been their share in the past. Their competitors will either have to compete as regards price, or cease operations, and no voluntary cessation which involves the idleness of billions of invested capital is probable. It is therefore reasonable to assume that coal prices will rule lower.

One serious limitation on cement last year was that of transportation facilities. For over five months the coal and transportation industries were, either singly or concurrently, seriously retarded by strikes. Just as the harvest and crop-moving seasons were ushered in these struggles were ended, leaving the railroads most severely taxed in the handling of necessities of life for the American people. Cars were scarce and motive power was limited. The personnel of the railroads was seriously impaired. With their limited facilities, the transportation lines of the country had but few cars for the handling of construction materials.

This impediment to the industry has been largely removed, and indications point to a further improvement every day. Vast orders for both rolling stock and engine power are beginning to be filled to such good effect that new cars and new locomotives are appearing everywhere. Old equipment is being rapidly repaired and each month's report shows a lower percentage of bad order equipment. There will be no cessation of coal production or coal transportation this summer and no corresponding wild demand for transportation facilities next fall and winter. Apparently cars will be available for the cement maker and user, when desired.

Thus, for the cement industry in the season of 1923-24, the track would seem to be clear of obstructions, and all signals set for full speed ahead. The main elements which go to make for business progress and prosperity all seem to be either present or in the

(Continued on page 31)

Design of Reinforced Steel Concrete Continuous Girder Bridge at Beloit, Wis.

In the cities and towns about the country are many iron or steel and wooden highway bridges built many years ago which are still in service in spite of the great increase in traffic loads. They are usually placarded with a warning against high speed or heavy loads and are maintained at some expense, but they are nevertheless a menace to pubic safety. In many cases their replacement has been delayed by the unfavorable condition of recent years. Now that conditions are more favorable for construction work, it should be apparent that the greatest economy can be affected by replacing such a structure with a bridge which would reduce the cost of maintenance and be safe under such heavy loads as may come upon it in spite of warning signs.

The nature of reinforced concrete permits such freedom in the selection of type and the detailing of a structure that the development of the design of a concrete bridge is a very interesting problem. A thorough study of the conditions in each particular case is necessary before it is possible to choose correctly between the various possible forms of arches and girders and then special details must usually be worked out to adapt the type selected.

By careful proportioning a skillful designer can secure an artistic effect without materially adding to the total cost. It should be realized that the proper artistic treatment calls for the services of an expert fully as much as the computation of stresses.

In designing a bridge which is economical and artistic, the cooperation of engineer and architect is as advantageous as in the designing of a large building. In fact, closer cooperation is necessary because the structural members themselves must be designed for appearance as well as strength.

In the case of the Shirland Avenue Bridge in Beloit, Wisconsin, the funds available and the location of the bridge did not warrant the spending of any money to give a monumental appearance so an attempt was made to design a bridge which should be as cheap as possible and at the same time of graceful and refined appearance.

The Rock River at Shirland Avenue is about three hundred feet wide with an average depth of about three feet at mean low water. The high water stage is six or seven feet higher and the current is strong, but an examination of the old bridge, a timber trestle carried on timber sills resting on the bed of the stream, showed that the action of ice was not severe. The bed of the river is a shale rock exposed to the current on the west side and sloping slightly down toward the east bank where it is overlain with a few feet of hard gravel.

The roadway is about 12 feet above mean low water at the east bank and slopes up at a four per cent grade to about 24 feet at the west bank. The excellent foundation conditions and height of the roadway suggested two types of construction—filled arches and continuous girders. Careful preliminary estimates showed that an arch bridge would cost for that particular location about 20 per cent more than a continuous girder bridge carried on columns and the latter type was adopted.

In addition to permitting the use of light and graceful girders, the continuous type effects a great saving in material at the piers which on suitable foundations can be constructed of columns carrying transverse girders at the roadway level into which longitudinal girders frame. With simple spans which require an expansion joint at each pier, the structure is not as rigidly tied together and the piers must usually be made solid to provide the necessary stability. Separate columns must be used cautiously where there is any danger of lodging of drift between the columns or the scouring of the foundations, but where those conditions are satisfied, the type offers a very economical solution.

The number and length of spans was determined by a study of the effect of span length and number of expansion joints on the total cost of structure. The height of the banks made it advisable to extend the end spans some distance beyond the shore line in order to cheapen the abutments. In this way the abutment walls were made light retaining walls. Of course, the nearer the river they came, the higher they would be, so the end of the span was located at that point where the cost per lineal foot of the two side walls and the fill was estimated to be the same as the cost per lineal foot of the river spans.

The bridge is in eight spans with expansion joints at the 1st, 4th, and 7th piers which divide them into single spans at each end and two series of three continuous spans. The expansion joints are formed by providing double girders and double columns down to the footings. It was found that there is no appreciable economy in having the girders continuous for more than three spans and the longitudal expansion and contraction under change of temperature became too great to be taken up by the flexure of the columns without inducing excessive bending stresses. The columns were investigated for stresses produced by lateral forces and temperature changes as well as for vertical loads and it was considered advisable to use spiral reinforcement to increase their toughness.

On account of the relative stiffness of the roadway and the flexibility of the columns, the continuous girders were designed as though resting on hinged supports. Influence lines and maximum moment and sheer curves were drawn for live and dead loads. The maximum live load stresses in the longitudinal girders were produced by two twenty-ton trucks placed in the most critical position for each section of the girder.

Strict economy demanded the use of a pipe railing but concrete piers were provided over the columns to give it a more substantial appearance. Cast brass bases and bronze bolts were used for the intermediate iron rail posts to prevent rust from weakening the posts and staining the concrete. The footings were carried down to solid rock. A cof-

(Continued on page 25)

The Shirland Ave. bridge at Beloit, Wisconsin.

A Notable Achievement in Crushing Plant Construction

Double Unit Plant of the Kelley Island Lime & Transport Company to Have Capacity of 10,000 Tons in Eight Hours.

Thoroughly in keeping with its position as a leading producer of rock products is the newest enterprise of the Kelley Island Lime & Transport Company at their Marblehead, Ohio quarry, where it has in process of erection a new crushing plant, which, both in size and in excellence of arrangement and construction, marks a notable achievement in the rock produets industry.

This company has operated the Marblehead quarry for a number of years, the prineipal output being flux stone and kiln stone for lime manufacture as well as agricultural limestone and commercial grades of crushed stone.

The high quality of the rock and the very favorable position of the deposit, adjacent to the leading steel making and industrial center of Ohio, and the facilities for rail and water shipment, have been important factors in the building up of a hugh volume of business. This volume has outstripped the original production facilities and rendered it necessary that the capacity and the efficiency of the plant be raised to the highest standard.

In building the new plant these things were considered: Safety of workmen employed; the production of a large tonnage of stone products meeting the most exacting requirements of the consumer; the continuity of operations; the minimum in plant interruption with allowances for major and minor repairs with small loss in production; the utilization of full carrying capacity of railroad freight cars and the closer supervision provided by having a campact plant.

The Marblehead Quarry

The Marblehead, Ohio quarry of the Kelley Island Lime & Transport Company is one of the largest in the country. Before crushing machinery and steam shovels came into use for stone quarry operation, there were over 1,000 men employed in breaking and loading stone by hand. The company was one of the first to see the advantages of labor saving machinery and at first installed a No. 6 gyratory stone breaker, having a capacity of from 300 to 400 tons per day. This crusher, as well as others was soon outgrown as is indicated by successive installations of numbers 7½, 8 and 9 gyratory breakers, three of the latter being in service at one time. Later a 6- by 7-foot Edison roll crusher was installed and this machine carried the burden of the production required during the late war. Such a fast growth of the business compelled the rebuilding of plants several times and in ways that would least interfere with continuous production of an ever increasing tonnage. The old frame structures, originally designed for low tonnage machinery, began to show the strain of the vibration and racking of the heavier machinery which was later installed, and at the end of the war it became necessary to provide a new plant, built to stand the wear and tear and to meet the future productive requirements.

The quarry is opened up over large areas giving a working ledge three and one-half miles long. The top or first ledge is worked from twenty-two to twenty-five feet deep of very uniform analysis and thinly stratified natural fluxing stone. The total area of quarry land consists of 3,000 acres of which 400 acres have been quarried, leaving 2,600 for future operation. The over-burden is light, usually not over one foot deep and consists of a light loam, this being removed by 3 Thew traction stripping shovels. In an operation of this size the disposition of stripping and by-products from the crusher becomes a serious problem, both as to location of property on which to dump the material, and the expense of handling it. At Marblehead, land which has been quarried out, is being filled with the by-products and covered with the stripping, thus reclaiming the land and making it into excellent farm property.

Drilling of the stone is done with eight well drills. After shooting, the quarry face is worked with ten heavy type railroad steam shovels and one 100 ton shovel mounted on caterpillar trucks. The latter is a very recent installation accomplished by placing the caterpillar trucks under a shovel which formerly was mounted on railroad trucks. It is believed that this is the first attempt to use the caterpillar trucks for moving heavy duty steam shovels in quarry operations and the results are being watched carefully by officials of the company and by many others who are interested in progress in stone quarries. The shovels and the crusher are now served by twenty-one miles of thirty-six inch gauge railroad, on which thirty-one Shay geared locomotives with 360 two-way side dump cars are worked. The new plant is equipped for both standard and quarry gauge tracks, requiring several miles of new tracks and additional railroad equipment. By having all quarry tracks from the shovels to the main crusher built practically without grades, each train will have an increased number of cars.

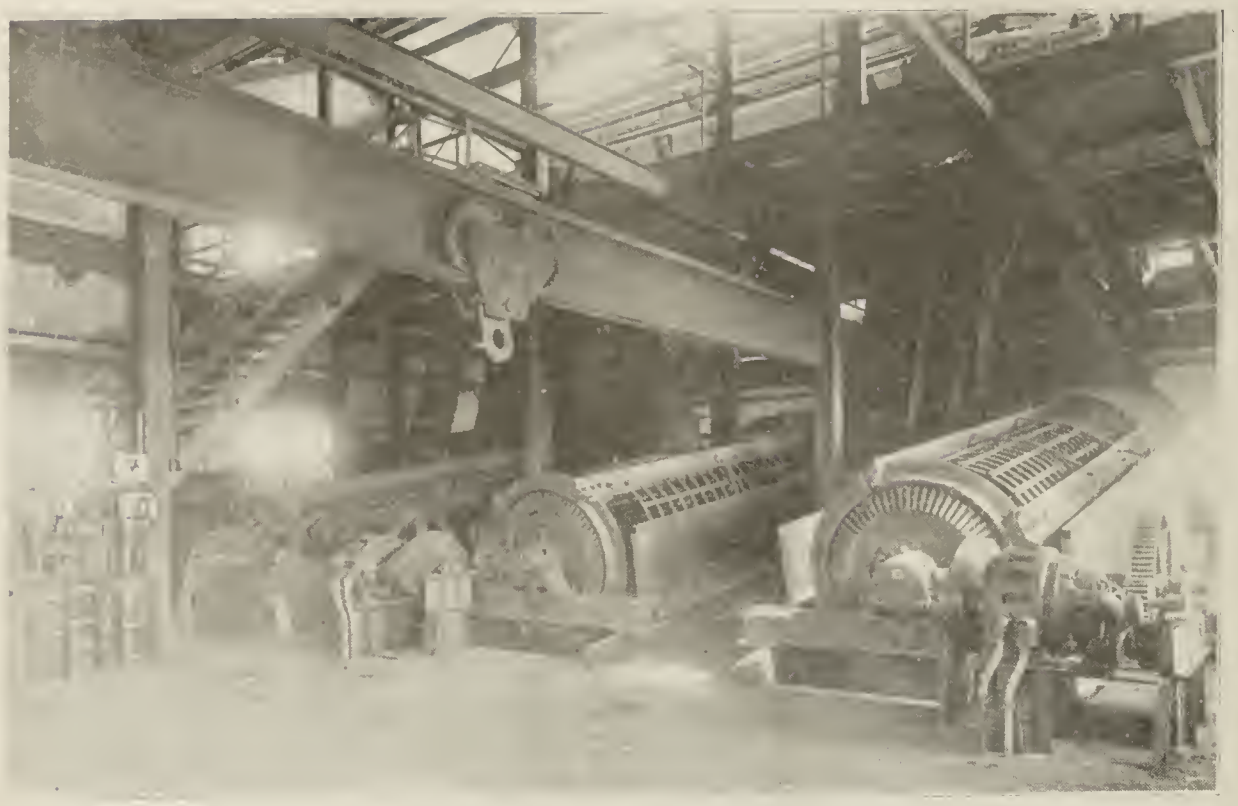
In the selection of the proper type of initial breaker for the new crushing plant, all of the types in use at the present day were considered and the decision made in favor of the gyratory type. Two units of this type were installed.

The company with the two unit installation has thus insured itself against the loss of production resulting from

A general view of the crushing plant of the Kelley Island Lime & Transport Co.

Section of Marblehead quarry, Sandusky Bay in background.

Progress photograph showing steel construction.



Construction of screen section, large floor space around each screen; motor controls at left and overhead.

breakdowns. At the same time the high capacity required warranted them in putting in units large enough to handle shovel loaded rock without excessive bridging and blocking in the receiving openings.

The No. 24 Allis-Chalmers gyratory breaker, having receiving openings forty-eight by one hundred twenty-five inches in size and capable of exceeding the required average capacity by an amount which will easily compensate for irregularities in train service, was selected as the best size for the purpose.

The two No. 24 crushers are located side by side in a large concrete lined pit, with their tops ten feet below the feed tracks which run through the crusher house at grade. There are two of these feed tracks, one on either side of the crushers, and the crushers are spaced to permit the simultaneous dumping of six ten yard side dump quarry cars, three on each side. This arrangement, while it necessitated a large expenditure for excavation and foundation construction, was decided upon as being the only practicable arrangement to handle the tonnage desired. It will permit the continuous passage of trains through the crusher house on both sides of the big crushers, each train kept intact at all times, with none of the time loss and dead equipment loss which attend the operation of the older type of incline-fed plant. It is obvious that the operating economies effected by the "subterranean" installation will quickly repay the additional initial investment in a plant having the capacity that this plant has.

The receiving hopper above the crushers is a big steel box, the stone being permitted to form its own hopper. The upper edges of the hopper on the sides adjacent to the feed tracks are chambered back to the rail to prevent the piling up of such fine material that may drop from the cars near the rail when the load is dumped. Dumping of those cars which do not balance toward the receiving hopper will be accomplished by air cylinders so arranged that their pistons will rise against the car body from beneath when the air is applied.

Each No. 24 crusher is driven from a 200 h. p., 720 r. p. m. slip ring motor through an English system rope drive, comprised of twenty-six turns of three-quarter inch rope.

The crusher pit, which extends thirty-nine feet nine inches below ground level, is heavily lined on its four sides and bottom with waterproofed concrete and is provided with an ample sump for catching any seepage which might occur. This sump is fitted with two vertical shaft motor driven centrifugal sump pumps equipped with automatic float switches. Either of these pumps is of sufficient capacity to easily take care of the anticipated seepage, the duplicate installation being merely a safeguard against the possible breakdown of one unit.

An electrical bridge type traveling crane, with a lifting capacity of fifty tons, spans the crusher house about forty-three feet above the top of the crushers. This crane will handle the heavy crusher parts when making repairs or replacements and will also be used for breaking bridges and blockades in the receiving openings.

Pan Conveyors:

Each No. 24 crusher discharges directly into a seventy-two inch pan conveyor which carries the material up a forty-five degree incline into the top of the screen house, the head shafts being located about eighty-eight feet above ground level. These huge conveyors are one hundred seventy-six feet long between centers, a length which exceeds by a considerable margin anything hitherto attempted in pan conveyor construction. A feature peculiar to this type of elevator is the great weight of the machine itself as compared to the live load which it is designed to handle and this feature, entailing as it does enormous weight and consequent high chain and head gear stresses, has in the past militated against the use of pan conveyors of over one hundred thirty feet centers.

In order to overcome this objection and to permit the installation of pan conveyors long enough to fit in with the balance of the plant design, which embodied the severe combination of crushers below grade and extremely high screen house, an ingenious contrivance was used in the form of an equalizing device located in the conveyor trestle about sixty-five feet below the head shaft. This device is designed to carry the entire dead load of the conveyor up to the point at which it is installed, leaving the upper sixty-five of dead load, plus the live load, to be carried by the head shaft. This contrivance is something strictly new in pan conveyor design and its conception has made feasible the employment of pan conveyors of a length that was heretofore considered utterly impracticable. Each pan conveyor is arranged for individual drive from a 200 h. p., 720 r. p. m. slip ring motor through silent chain drive and speed reducing gearing. Powerful automatic devices are provided on each head shaft to prevent the backing up of the conveyor in the event of power failure when they are under load. Repairs for the head

All gears are cut steel; silent chain drive. An overhead crane for handling repairs can be seen in upper right hand corner. Light and ventilation in plenty.

shaft and driving mechanism will be handled by a five ton bridge type overhead crane arranged to serve both machines.

First Battery of Screens:

Each seventy-two inch pan conveyor discharges directly into two sixty inch by twenty-four feet steel frame closed end Gates and revolving screens arranged in a parallel battery. Each of these screens is geared direct to a twenty-five h. p., 720 r. p. m. slip ring motor. The first twelve feet of each screen barrel is fitted with tank steel sections having three inches round perforations. Surrounding these sections is a ten foot jacket of the same material having two and one-quarter inch perforations. The remaining twelve feet of the barrel is fitted with sections built up of strap steel laid crosswise and riveted at each intersection. These straps are spaced to give a six inch square opening. The material passing through these six inch perforations, combined with the minus three inch plus two and one-quarter inch material rejected by the jackets will constitute the finished flux and will be chuted to the proper storage bins below the screen rooms.

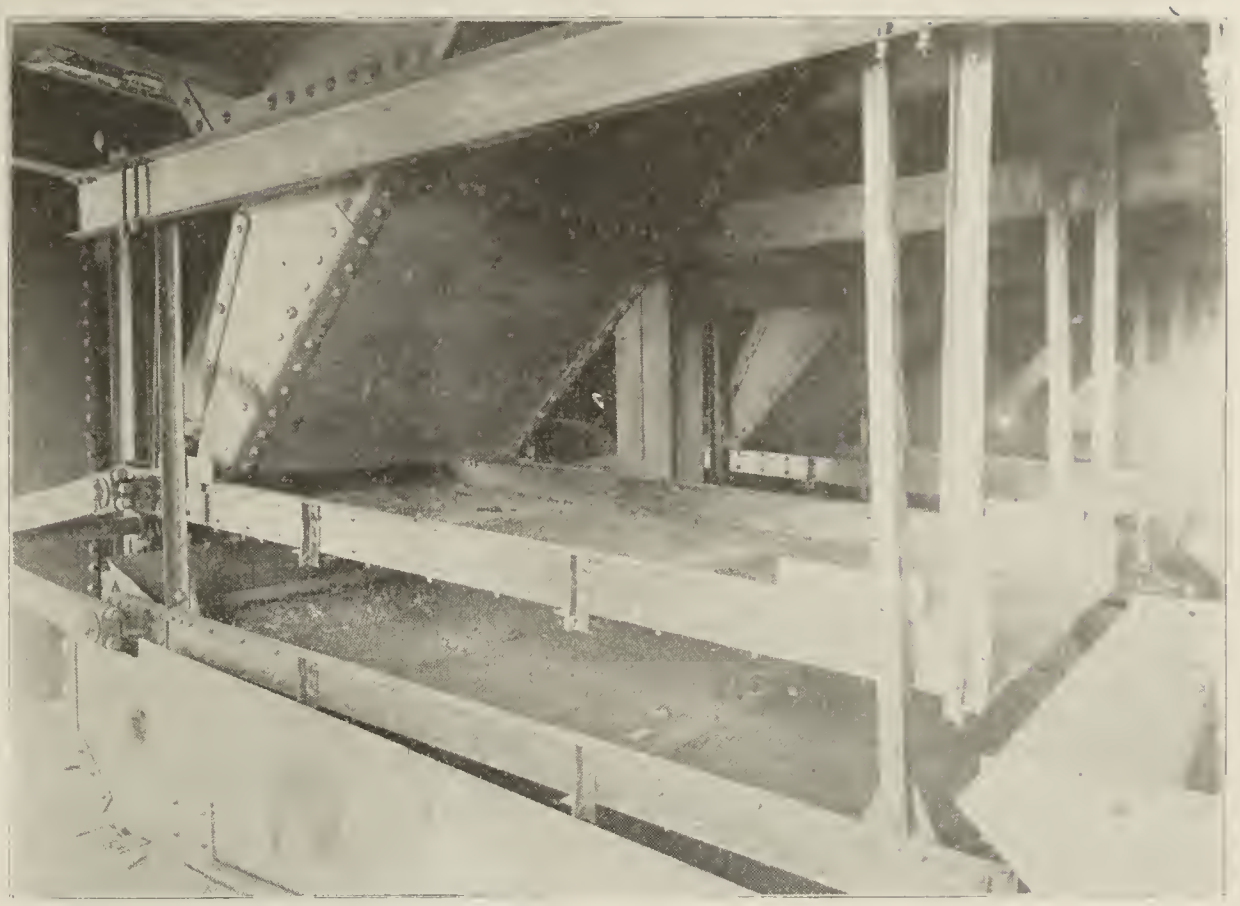
Second Battery of Screens:

The minus two and one-quarter inch material passing through the jacket perforations will pass into a second battery of four forty-eight inchs by twenty feet steel frame closed end Gates revolving screens located below the sixty inch screens. These secondary screens are also arranged for geared drive from four 20 h. p., 720 r. p. m. slip ring motors. It is here that the separation of the various commercial sizes begins. The screen barrels are fitted for their entire length with tank steel sections having one and one-half inch round perforations and each screen is equipped with a ten foot dust jacket having seven-eighths inch perforations. The clean minus two and one-quarter inch plus one and one-half inch and minus one and one-half inch plus seven-eighths inch sizes made by these screens is chuted to the storage bins as finished product.

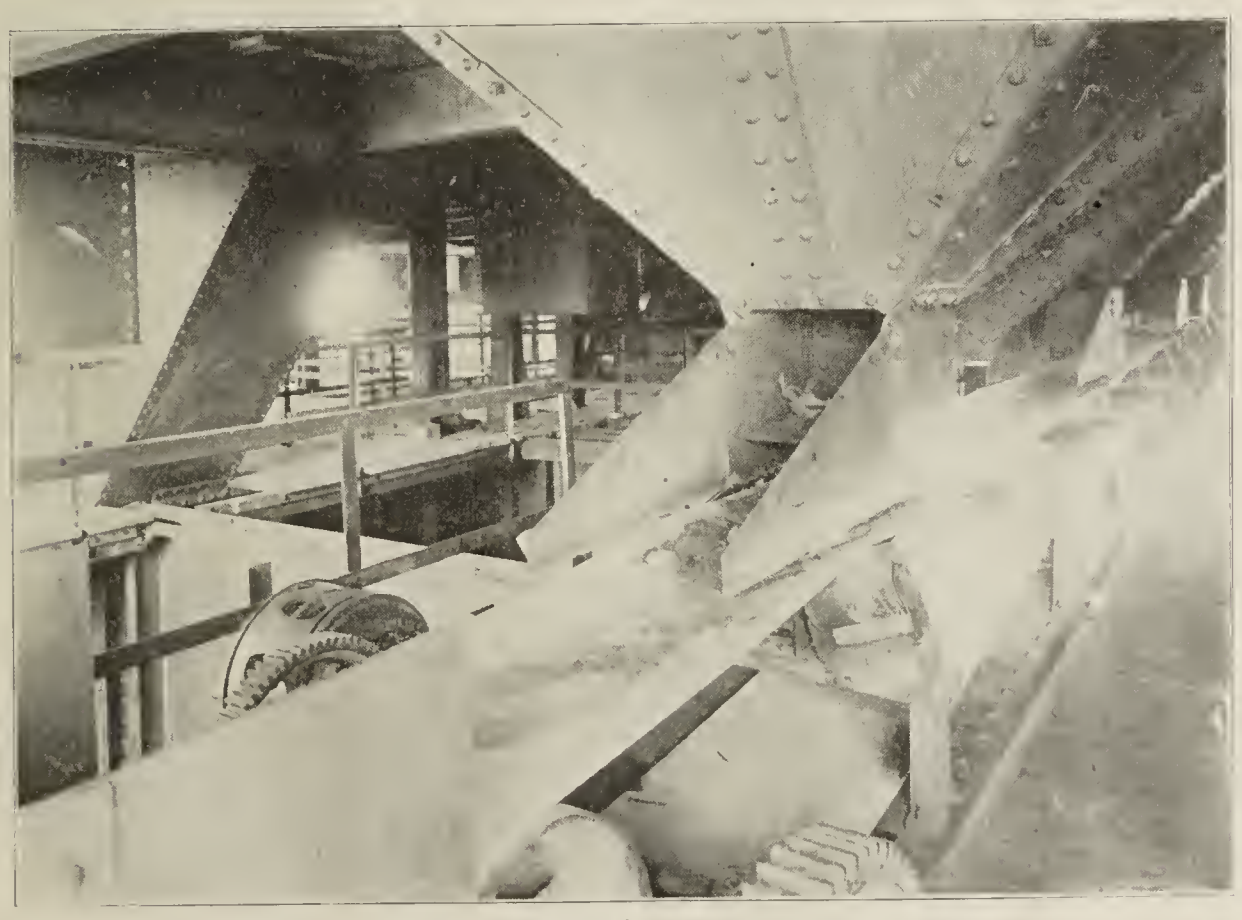
Shaking Screens:

The minus seven-eighths inch stone passing through the forty-eight inch screen dust jackets will go to four five by ten feet double deck shaking screens. Each of these screens is arranged for individual drive belt from a 10 h. p., 720 r. p. m. squirrel cage motor suspended from the joists of the forty-eight inch screen floor above. Both decks of these shaking screens are fitted with wire cloth, the upper deck having five-eighths inch openings and the lower three-eights. Here again the finished minus seven-eighths plus five-eighths inch, and minus five-eighths plus three-eighths inch stone is distributed by gravity to the proper bin compartments.

A twenty inch belt conveyor gathers the minus three-eighths inch material from all four screens and discharges it to a second twenty inch conveyor which in turn discharges to a vibrating screen which separates the material into three-eighths, one-quarter inch and dust, this constituting the final separation into commerical grades.



A view of the four double deck shaking screens.



Shaking screens discharging onto belt conveyors.

Secondary Crushers:

Having followed the commercial screening process through to its conclusion we will return to the treatment of the oversize material rejected by the initial battery of sixty-inch screens. This oversize product, which will run from eight to ten inches in size will be used for kiln stone for lime manufacture, the Kelley Island Lime & Transport Company being a leading producer of the latter commodity.

Realizing, however, that the production of oversize will at times exceed the demand provision has been made for reducing this rock to flux size and under in two No. 8 "K" Gates gyratory crushers located in the screen house, with their tops ten feet below the discharge end of the sixty inch screens. The rejections chutes from these screens are so arranged that the rock can be dropped into the crushers or by-passed to the oversize storage bins as occasion may require. The No. 8 crushers are so located that each of them will receive the rejections from two of the battery of four sixty inch screens. These crushers are belted to 75 h. p., 720 r. p. m. slip ring motors.

A fifteen ton crawl over each machine will serve them for repairs and adjustments, the crawl beams being extended outside the building to facilitate the hoisting of heavy repair parts from the ground.

The No. 8 crushers discharge into two No. 8 belt and bucket elevators, fifty-one feet long between centers. These elevators pass up between the two pairs of sixty inch screens and discharge into these screens, thus closing the circuit and insuring the reduction of all material to flux size and under when desired. The elevators are equipped with steel frames and are geared direct to two 20 h. p., 720 r. p. m. motors.

Storage Bins:

The storage bins under the screen house are divided into thirty-two compartments having a total active capacity of approximately four thousand six hundred tons. The bins span five loading tracks, four of which are equipped with track scales for weighing the cars as they

are loaded. This arrangement of track scales beneath the storage bins is believed to be unique, applied as it is to so many loading tracks. These scales are of the latest design complying with the requirements of the American Railway Association and the recommendations of the U. S. Bureau of Standards, providing the most accurate and dependable facilities for weighing cars as they are loaded thus eliminating the cause of complaints regarding shortages, and the friction between the shipper and the consumer caused by such controversies.

A decisive factor in connection with such an elaborate system for weighing was the question of car supply. Car shortages affect all shippers, but none more than the quarry operators. When the railroads of the country were making a drive for intensive loading of equipment, an analysis of car loading was made. This disclosed that cars could only be loaded to full carrying capacity by weighing them as they were loaded, and that by utilizing the full capacity, it was possible to increase the average load to an extent that permitted the shipment of tonnage equivalent to 3,200 extra cars in twelve months without asking the railroads to increase the number of cars furnished for loading. This was actually accomplished at the old plant, and inasmuch as the new plant will provide for loading a larger percentage of the total cars on the scales, it seems reasonably certain that even better results towards intensive loading of railroad equipment will be obtained. An interesting feature in connection with the scale installation, providing four modern scales, all parallel, is the fact that by means of extension levers all weigh beams are located in a small but well lighted and convenient weigh house and all weighing will be performed by one weighmaster who will have the four weigh beams within easy reach.

Arrangements have also been made for loading on a sixth track running alongside the oversize bins, which are the outside row of bins on the side of the building farthest from the crusher house.

The bottom discharge bin gates are all of the scissors type, developed by the Kelley Island Company and built in its own shops. Four thirty by thirty inch air operated quadrant bin gates with hinged counter-weighted spouts will serve the outside track mentioned.

All tracks serving the screen house are gauntlet tracks having both standard and thirty-six inch gauge, making it possible to load any product in standard gauge cars for rail shipment, or to load in narrow gauge cars for any one or all of the following purposes:

Oversize stone to lime kilns; any finished product, either to stock pile or to dock for boat shipment and fine material to agricultural limestone grinding plant. Elevated runways are provided from which the car loaders can operate the bin gates and observe the cars from above as they are being loaded.

Buildings:

The crusher house, bins, screen house and conveyor gallery are constructed of steel throughout with corrugated siding and roofing. It is believed that this plant will serve as a model in the provisions made for interior lighting. Large double window spaces are allowed for in each bay and above each floor, insuring excellent lighting in the interior of the building under all weather conditions. These spaces are fitted with steel sash, glazed with plain glass to permit clear vision over the quarry. The proportions of the building are generous in every part and the utmost care was exercised to provide ample space around each machine for inspection, lubrication and repairs.

Freight and Passenger Elevator:

No crushing plant yet erected has as thorough provision as has this plant for handling repairs in a quick and efficient manner. Not only have cranes and crawls been installed over all the heavier machines, but an electrically operated freight and passenger elevator has been put in which will serve every floor in the screen house. This elevator has sufficient lifting capacity to handle repair parts for every machine in the building, excepting only the heavier parts of the two No. 8 crushers. Mention has been made heretofore of the arrangement for hoisting these heavy parts into the building, an operation which will have to be performed very infrequently.

The value of an elevator in a plant of this size and character can hardly be overestimated, and no piece of equip-

Crushing plant showing hopper for two No. 24 K. breakers.

ment in the plant will render a return on the investment more quickly than will this equipment. Not only will it serve to expedite the hoisting of repair parts to the various floor levels, but it will also afford a quick and easy means for the operating men and foremen to get into every part of the building for inspection. This is a feature that has been sadly overlooked in practically all high crushing plants in the past with the inevitable result that the upper parts of the building are generally unknown regions to the supervising members of the operating crew.

In addition to the elevator, there are stairways reaching every floor and there are also stairways extending along both sides of the pan conveyors. These pan conveyors are completely housed in from top to bottom. These latter features are refinements which will be envied by those operators who are running pan conveyors erected in the old way on skeleton trestlework with nothing overhead but the sky and nothing alongside but air.

Unusual precautions have been taken to insure the bodily safety of the men who will operate the plant. Guards made of heavy sheet metal enclose all of the gears and special care has been taken to make these gear guards dust proof. All belts and other moving parts which might be dangerous to the operating crew have been thoroughly guarded. All runways and stairways are equipped with heavy hand rails and toe boards.

Both the screen house and crusher house are constructed with pent houses above the center bay. These pent houses are fitted along both sides with large butterfly ventilators, the idea here being to create an upward air draft through the building which will carry away a considerable percentage of the dust that would otherwise settle on the floors, beams, and machines in the building. The ventilators in the crusher house will also serve to carry away the smoke created by the locomotives as they pass through.

Power:

That phase of the plant design embracing the electrical equipment has been taken care of with a thoroughness that is rather unusual in crushing plant construction and the details are interesting and instructive enough to warrant treatment at some length. The feature of individual drive has been consistently carried out in the new plant. Every machine in the plant has its individual motor and most of these motors are geared directly to the machine which they drive. Belts and rope drives have been used only where their use was essential in order to absorb shocks and irregularities of drive which are inherent in the particular machines for which this type of drive was selected.

In the design of the electrical system throughout, including switching equipment with its protective features, power distribution, etc., the dominating thoughts were—First—Safe operation for man and equipment; Second—Economical and continuous production and assessibility of machinery for quick repairs; Third—To obtain graphic record of operations.

Electric power is purchased from a public utility company located twelve miles away and delivered at 23,000 volts, three phase twenty-five cycle, over a transmission line serving this plant alone. This current being stepped down to 460 volts through three Allis-Chalmers 500 k. v. a. single phase oil insulated self cooled transformers installed in a fire proof substation located at one corner of the crushing house adjacent to the pan conveyors. This sub-station will also house all primary switching equipment, aluminum cell lighting arresters, main switchboard, and other necessary apparatus.

General

No expense and no effort has been spared by the officials of the Kelley Island Lime & Transport Company and those who cooperated with them in the designing, equipping and erecting of this plant to make it modern, efficient and complete in every detail.

The plant was designed by the engineers of the Allis-Chalmers Manufacturing Company, working in conjunction with the Kelley Island Company officials. The crushers, pan conveyors, screens, elevators, belt conveyors, quadrant bin gates, transmission equipment and all electrical equipment were furnished by the Allis-Chalmers Manufacturing Company.

The officials of the Kelley Island Lime & Transport Company whose progressive policy has made this plant possible are: John A. Kling, president, G. J. Whelan, vice president & general manager, I. J. Sauvey, superintendent of construction and A. C. Schultz, chief engineer.

Wisconsin Concrete Products Manufacturers Convention

The first annual convention of the Wisconsin Concrete Manufacturers was held in the Red Room of the Pfister Hotel, Milwaukee, Wis., on Tuesday, February 20 and Wednesday the 21st. The attendance was all that could be desired, about one hundred attending each day of the sessions.

During the meeting about fifty members joined the association and the following were elected officers: President, W. H. Carey, of the Carey Concrete Co., Wisconsin Rapids, Wis.; Vice President, George Yunker of Yunker Brothers, Milwaukee, Wis.; Secretary-Treasurer, D. R. Collins, Milwaukee, Wis. The following gentlemen were made district representatives: George Lengst of the Prairie Concrete Products Co., Prairie du Chien, Wis.; I. J. Westerveld of the Wausau Concrete Co., Wausau, Wis.; Julius Sorensen of Racine, Wis.; M. N. Hein of Madison Cement Stave Silo Co., Chippewa Falls, Wis.; George Aschbrener of West Side Granite & Block Co., Wauwatosa, Wis. and C. O. Gochnauer of the Gochnauer Concrete Block Co., Appleton, Wis.

The by-laws and constitution were read by Wallace R. Harris, president of the Concrete Products Association of Chicago and were adopted by the convention.

The convention had a remarkably well rounded program filled with discussions of interest to the industry. It was subdivided into four main sections, marketing concrete products, manufacturing concrete products, concrete block for house construction and selling a product of known quality.

One of the interesting features of the meeting was the illustrated lecture of Leslie H. Allen of the Portland Cement Association of Chicago. He exhibited about one hundred stereopticon views giving point to a well prepared address. Another feature was the guessing contest on the strength of a concrete block. The engineering laboratory of the Marquette University is to give the decision. This prize by the way is a very practical one. The winner gets three concrete blocks tested free of all charges for his reward.

The program is shown below:

Tuesday, February 20

Forenoon Session, D. R. Collins, Presiding

Marketing Concrete Products

9:00 a. m.
Registration.

10.00 a. m.
"Address of Welcome"—
Phil. Grau, Milwaukee Association of Commerce.
"Purpose of Meeting and Scope of Industry in Wisconsin"—
L. S. Brodd, District Engineer, Portland Cement Association, Milwaukee, Wis.
"Who Is My Competitor?"—
D. Q. Graybill, Educational Department, James Manufacturing Co., Fort Atkinson, Wis.

Afternoon Session, Wallace R. Harris, Presiding

Manufacturing Concrete Products

1:30 p. m.
"Recent Developments in Manufacturing"—
W. R. Harris, President, Concrete Products Association, Chicago, Ill.
"Making Products Plants Pay Dividends"—
J. W. Lowell—Chairman, Committee P-6 American Concrete Institute, Chicago, Ill.
"Consistency and Aggregate Requirements"—
George Leuty—Manager, Beloit Concrete Stone Co., Beloit, Wis.
"High Lights in Manufacturing"—
This paper read by W. H. Carey.

Evening

6:30 p. m.

Banquet

Toastmaster, F. A. Cannon, Executive Secretary, Wisconsin Good Roads Association, Madison, Wis.

9:00 p. m.
Smoker and Entertainment
Courtesy, Products Machinery Manufacturers.

Wednesday, February 21

Forenoon Session, W. H. Carey, Presiding

Concrete Block for House Construction

9:00 a. m.
"The Anatomy of the Concrete House"—
Leslie H. Allen—Assistant Manager, Concrete House Division, Portland Cement Association, Chicago, Ill.
"Portland Cement Stucco"—
F. J. Gardner, Western Service Manager, Atlas Portland Cement Co., Chicago, Ill.
"Selling the Concrete Block House"—
W. H. Carey, Manager, Carey Concrete Co., Wisconsin Rapids, Wis.

Afternoon Session, A. W. Scheer, Presiding

Selling a Product of Known Quality

1:30 p. m.
"Building Codes"—
W. C. Muehlstein, Building Engineer, Wisconsin Industrial Commission, Madison, Wis.
A. W. Friske, Milwaukee Concrete Products Association, Milwaukee, Wis.
"Testing Concrete Building Units"—
J. C. Pinney, Jr., Dean of Engineering, Marquette University, Milwaukee, Wis.
"Fire Tests on Concrete Block"—
L. H. Allen, Chairman, Committee P-5, American Concrete Institute, Chicago, Ill.
"Selling Concrete Products Through Advertising"—
C. O. Gochnauer, Manager, Gochnauer Concrete Block Co., Appleton, Wis.
"Advertising That Will Sell Products"—
James W. Fisk, Merchandising Counsel, The Milwaukee Journal, Milwaukee, Wis.

Among those present were:

Aschbrener, Geo., West Side Granite & Block Co., 133 Greenfield Pl., Wauwatosa, Wis.; Babcock, O. H., Babcock Concrete Block Co., 1486 Holton St., Milwaukee, Wis.; Beyer, Harry, Beyer, Harry, Mishicot, Wis.; Breest, H. J., Concrete Products Co., Thiensville, Wis.; Broker, A. E., Badger Concrete Tile Co., Plymouth, Wis.; Brown, H. E., Consumers Supply Co., Milwaukee, Wis.; Carey, W. H., Carey Concrete Co., 348 Grand Ave., Wisconsin Rapids, Wis.; Childs, M. H., Cast Stone Const. Co., Eau Claire, Wis.; Christiansen, Louis, 117 Salem Ave., Kenosha, Wis.; Cupry, Harky, Cupry-Vandermolen Co., Friesland, Wis.; Davelaar, Geo. H., Davelaar & Son, 153 Pryor Ave., Milwaukee; Devos, W. H., W. H. Devos & Co., 3115 Auer Ave., Milwaukee; Friske, A. W., 47th & State Sts., Milwaukee; Gochnauer, C. O., Gochnauer Concrete Block Co., Appleton; Gurney, W. W., Madison Cement Stave Silo Co., Sparta; Hein, M. N., Madison Cement Stave Silo Co., Chippewa Falls; Henschel, Ernst, 268 4th St., Kenosha; Jens, Fred E., 1478 5th St., Milwaukee; Johnson, O. C., Spring City Block Works, 117 Charles St., Waukesha, Wis.; Knipple, Louis R., Stoddard, Wis.; Kopf, Joseph, Kopf Concrete Co., Fond du Lac, Wis.; Krohne, F. C. Prestone Products Corp., West Allis, Wis.; Lengst, G. J., Prairie Concrete Products Co., Prairie du Chien, Wis.; Leverenz, Oscar, Best Block Co., Keefe Ave. and Fratney, Milwaukee, Wis.; Luety, Geo., Beloit Concrete Stone Co., Beloit; Maramonte, Jos., Maramonte Cement Blk. Co., 29th and Mitchell St., Milwaukee; Meixner, A. G., Concrete Products Co., 1429 22nd St., Milwaukee; Mueller, James, 819 10th St., Oshkosh; Olsen, Chris., Badger Concrete Co., Oshkosh; Parsons, C. W., Wausau Concrete Co., 313 Jefferson St., Wausau; Podach, F. E., Stevens Point, Wis.; Poth, Jos., 385 Ellen St., Milwaukee; Deinlein, Emil C., Home Building Supply Co., 1294 11th Ave., Milwaukee; Rathke, Wm. G., Seyberth-Neuser Co., Eau Claire; Roethel, H. G., Rome, Wis.; Richardson, C. E., Ill.-Wis. Conc. Pipe & Tile Co.; Rose, Frank, Kewaskum, Wis.; Rowe, A. C., Genoa Junction, Wis.; Saunders, John P., Big Bend, Wis.; Scheer, A. W., Best Block Co., Keefe Ave. and Fratney St., Milwaukee; Schwalbe, L. E., Economy Block Co., 8th and E. North Ave., Wauwatosa; Schwan, W. L., 376 Western Ave., North Milwaukee; Sorensen, Julius, Racine, Wis.; Stelter, Ed., Randolph, Wis.; Schreurs, H. K., Cedar Grove, Wis.; Termaath, B. C. Keystone Cement Co., Janesville; Thomas, Geo. O., New London, Wis.; Vandenberg, E. L., Vandenberg Cast Stone Blk. Works, Kaukauna; Voskuil, B., Cedar Grove Conc. Prod. Co., Cedar Grove, Wis.; Waite, J. H., Waukesha Cement Tile Co., Waukesha, Wis.; Westerveld, I. J., Wausau Concrete Co., Wausau; Whitnall, E. F., Shope Brick Co., 50th and State; Woody, C. C., Madison Cement Stave Silo Co., Madison, Wis.; Yahr, Leonard J., West Bend Concrete Products Co., West Bend, Wis.; Yunker, Geo., Yunker Bros., 615 37th Ave., Milwaukee, Wis.; Zeitler, Herman, Banner Mill & Feed Co., Prairie du Sac, Wis.; Zilisch, F. W., Granite Concrete Stone Co., 1070 Humboldt Ave., Milwaukee.

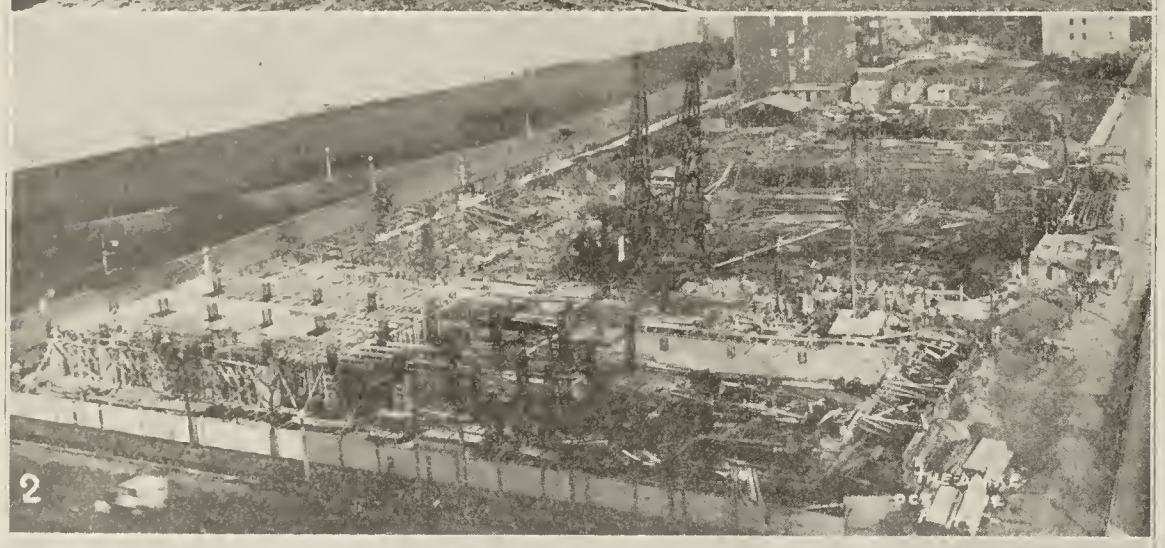
There were no machinery exhibits at the convention although several prominent manufacturers were represented.

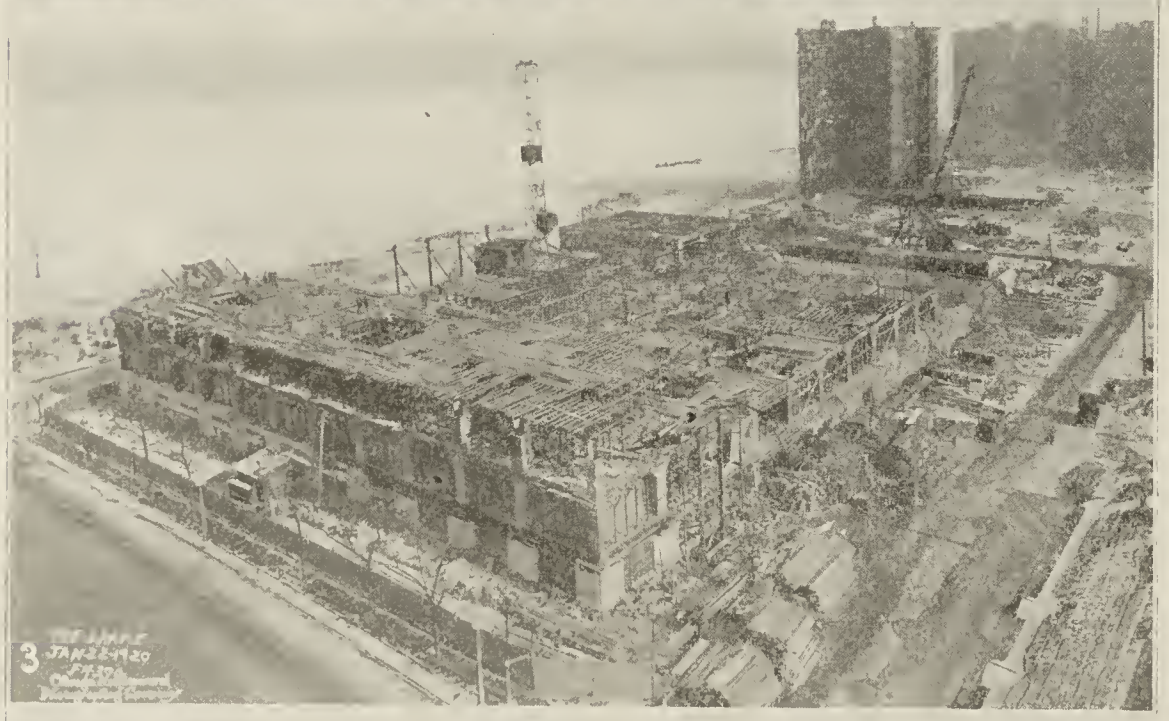
Railroads Plan to Spend $1,000,000,000 in 1923

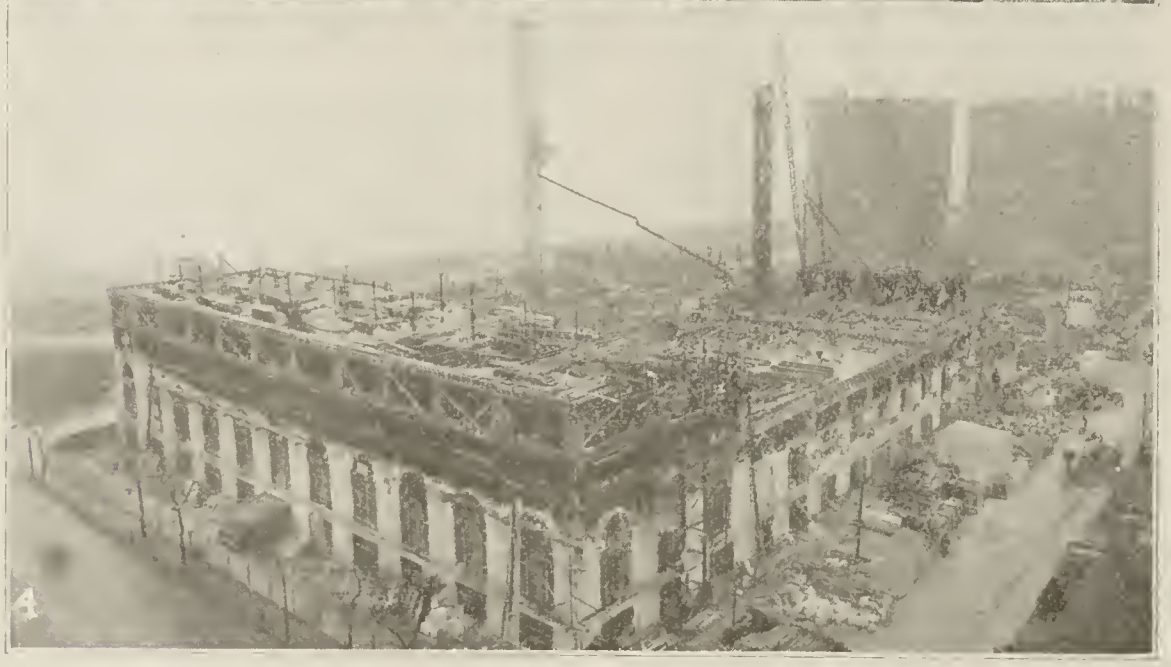
Budget announcements by the railroads and their buying plans for 1923, as revealed through applications to the Interstate Commerce Commission, indicate that a billion dollars will be spent in 1923 by the carriers for new cars, new locomotives, and additional terminal and track facilities.

New cars will be ordered to meet the rush of business expected with reopening of the building boom and other activities in the spring and about 1,000 miles of track will be added to existing systems to make up for the virtual cessation of track extension during the last ten years.

"Certainteed" Value in Progress Photographs







The picture's the thing! A diligent explorer, working unnoticed in far off Egypt unearths the tomb of Tut-Ank-Ahmen, 35 centuries after that pharoah's demise. Cables hum with the news. The world sits up and takes notice, reads what it has time for and depends on pictures for a real comprehension of what the discovery means. Over our breakfast coffee, or in a movie palace, we realize that a picture often tells in a moment or a flash what it would take paragraphs to describe—usually gives details that words could never give. "It is surprising to reflect," says an expert, "how much of what makes life interesting could be reproduced by pictures alone, if all written or printed records of the present time should be lost. Seeing is not only believing, but understanding."

DESCRIBING THE PICTURES.

1. The Start of the Drake Hotel. 2. Three Months later. Plenty of Signs of Progress. 3. Three Months Later Again. Note the Difference. 4. Eight Months After Breaking Ground. "Snapping Up!" 5. Two Months Later. Another Angle. More Stories. 6. Exceptional Progress Shcwn in the Succeeding Two Months. 7. Only Two Months Later, and Nearly Done. 8. The Finished Job. This Picture Taken Two Months After Preceding One.

Suppose, for instance, some Egyptian explorer should unearth some actual photographs—not hieroglyphic sketches—of the pyramids in the course of construction. We would cease to speculate on the way the great Cheops was built; we would understand from *seeing* how the vast army of toilers, ages ago, pyramided tons upons tons of stone to the everlasting wonderment of succeeding generations. But imagining process photographs of the Great Pyramid is roving too far afield for the subject in hand. What is of vital interest now is the practicality of photographs on everyday construction work.

Years ago, when progress reports were all made in writing—or by word of mouth—engineers, architects and builders of projects of importance were in the position of the busy enthusiast who gathers a mass of information on the subject nearest his heart and after he gets it all done runs smack into the practical question, "Now you've got it, what are you going to do with it?" What they needed nine times out of ten was not a bundle or a file of drawings, descriptions and written explanations, but definite, incontrovertible evidence on the progress being made on the job in hand. Especially was that true in legal pro-

ceedings where, in many cases, drawings and descriptions were inadequate. Something had to be done to simplify the means of getting at the facts—and nothing but the facts—when disputes, misunderstandings and malpractices arose.

Invention offered a helpful hand, with patent filing cases and simplified forms. Efficiency engineers found means of cutting out unnecessary detail and developed the fine art of ready reference to the nth degree. But progress reports were never satisfactory until photography stepped in.

It is not known who first suggested the idea of using progress photographs. Whatever his name, the world owes him a debt of gratitude. One might even go so far as to say that the application of his idea to business has done more to shorten and prevent arguments, settle and avoid disputes, save time, words, paper, damages, etc., than most anything you can think of offhand. The photograph has come to be the most important of records; and one, furthermore, that is automatic, accurate and indisputable. "A camera never lies."

The element of the unexpected is a recognized part of all construction work. How to anticipate it. Put a camera on the job. Get real pictures of the men at work. Have prints numbered and dated and mailed to the home office, if it is away from the project, regularly and carefully. Keep them in order. How better for the contracting firm, which may very well be miles from the building under construction, to ascertain the exact status of the work? Progress photographs will assure the main office that the progress of the work is—or is not—all that can reasonably be expected. Prints can be made large enough and in sufficient detail to enable the "powers that be" to make their own deductions intelligently without having to rely entirely on the roseate or pessimistic reports of the superintendent, written on the ground.

Arguments frequently arise over the time limit set by the architect for the completion of a given building. When the builder crowds him, he crowds the contractor, who in turns crowds somebody under him. Most contracts are so written that certain unavoidable circumstances constitute sufficient reason for delay, without the enforcement of penalties. If in a series of monthly or bimonthly photographic reports, consisting of views taken of the work in progress, it can be shown that the work was pushed to the limit up to the time when the unavoidable delay occurred, penalties can be avoided.

In a certain large eastern city pedestrians were killed by an accident in building construction. It was impossible to fix responsibility, but the newspapers shrieked negligence in rubber type. Had pictures been taken of the job as it went

(Continued on page 34)

Selling the Concrete Block House*

By W. H. Carey

President of the Wisconsin Concrete Products Association.

We are happy to be able to report to this meeting some degree of success in selling material for the construction of concrete block houses in our community, which houses have, in every instance, given complete satisfaction to their owners. In order to accomplish this very desirable result, the block, of necessity must have been of good quality. It has been our constant aim and purpose to manufacture block meeting the above requirement.

The fact that many of the residences, several among the best and finest in our little city, are built of our block, is the most convincing evidence that our aims and purposes have not entirely failed. We started this business about fourteen years ago. Soon afterward we learned, (too late to sidestep trouble,) that we were laboring under a most serious handicap in trying to find a market for our product. This condition was due mainly to the fact that another company, making so called concrete block, which had been operating for a period of five years prior to our start, had most effectually killed the reputation of all concrete products in our community.

Had I been aware of this conditions in time and had I known of the heartaches, worry and sleepless nights it was to bring me, I think I should probably have continued as a traveling salesman. We soon learned that our principal problem was, to either redeem the defunct reputation of concrete products, or go to the poorhouse.

To make bad conditions still worse, in my ignorance and inexperience, I made a poor choice in the purchase of our first equipment, with which we were not able to turn out products of recent quality.

Just to illustrate what I was up against that first summer, fully determined to make good product, I kept increasing the proportion of cement in the mix until our actual shop cost was twelve dollars per thousand on brick, which we were compelled to sell, delivered on the job, at eight dollars per thousand, but the worst of it was, they were not good brick, even at that exorbitant cost. So, in addition to the black eye given concrete products by the other company, our own product of that first year, while not quite so bad, yet was bad enough to make the case of concrete products still more hopeless in our vicinity.

Never having learned the meaning of the word "Discouraged," I kept on experimenting until I satisfied myself that more water was needed in the mix to make a good quality concrete, than we could use with our equipment, so I searched the entire field for equipment which would permit the use of enough water, finally finding what was at that time a new and but little known system, "the Zagelmeyer," bought and installed same in time for our second season's run, which ended our serious troubles. We were the pioneer in the use of this system in Wisconsin and I think the second user in the whole field.

The first residence of importance built of our block, was that of H. G. Demitz, Assistant Cashier of the First National Bank of our city, built in 1911, two story and basement built of 8" plain cast block, 26'x52' rough cast stucco finish outside, furred lathed and plastered inside, concrete trim of our make used, cost about $10,000. This residence proved so satisfactory, that he recommended our block to his friends, who, after building their residences with these block, passed the good word along to their freinds, thus building up a good live market, based almost solely upon the quality of the block furnished. We are, I think, justly proud of the fact that a large number of the finest class of residences in our city are built of our product, ranging in cost from about $3,000 up to one which cost, nine years ago, the sum of $22,000 at a time when the price of everything was low, it would, no doubt, cost more than $40,000 to build this residence now.

While this is the most expensive residence for which we have furnished block, the best and most interesting feature of same is, that it was built, owned and still is occupied as a residence by the president of our leading lumber company which operates a chain of twelve lumber yards throughout central Wisconsin. This gentleman's sole business was and is, selling building material, yet when he came to build his own residence, he used our block, at our regular prices to all customers, without any concession whatever to him as a dealer. This fine compliment, coming from our strongest competitor, made us feel that we were indeed making some progress toward redeeming the reputation of concrete products.

A very large proportion of the residences constructed of our block, cost when built from $10,000 up, $12,000, $15,000, $18,000, besides the one just cited at $22,000, all with rough cast stucco finish. In addition to the fine residences constructed of our block, we are proud of our Elk's Club of rough cast stucco finish costing $35,000; our Edison School, the latest one built, costing $40,000; our new City Hall costing $35,000; our Riverview Hospital costing $50,000; these last three veneered with brick: two large picture theaters, the largest garages, store buildings, factory buildings of large size, all in our city, as well as many important buildings in various other cities within our shipping radius, including one bank building and several school houses.

Just to show how good quality block will promote sales, independent of personal effort, I want to tell you, briefly, of a sequence of events. A few years ago, we sold block to Martin Joostin and Elmer Crotteau, with which to build their residences at Rudolph, eight miles north from us. About a year and a half later, Frank Grab, who lives four miles still farther north from them, a man I had never met, walked into my office, bought and paid for block with which to build his new residence. About one year later, Martin Konopi, who lives three miles north from Mr. Grab, came in and repeated what Mr. Grab had done. About one year later George Stashik, a nephew of Mr. Konopi, did the same thing, and then a year later August Stashik, a brother of George, repeated the performance. I did not even know of the existence of any of these men until they walked into my office. They all told me it was upon the advice and recommendation of their neighbors and friends who had previously built with these block, that they came to me unsolicited.

I know of many other cases where jobs sold by us in new fields have brought repeat orders, in fact this is the rule rather than the exception. One case in point, Albert Miller & Co. of Chicago, first built a potato warehouse of our block at New Arkdale, Adams County, the second one at Boyceville, Dunn County, the third at Glenwood City, St. Croix County, only a few miles from St. Paul.

The freight charges for the last two jobs making the cost of our block shipped about 150 miles, a very much higher than local block, or block from St. Paul would cost. This firm knew from experience the quality of our block and preferred paying a premium for them, rather than to take any chances on block, the quality of which they did not know. It is not my purpose to boast of what we have done, because we have accomplished but very little; up to this time, I have cited you these cases solely for the purpose of bringing home to you what I consider a mighty important feature of this concrete products business and hope I may be able, in my poor way, to so impress this upon your minds, that it will not be readily forgotten when you return to your homes, that permanent success is much surer and easier of attainment where you have a first class product, coupled with even only quite indifferent selling ability, rather than first class selling ability, coupled with a product of indifferent or poor quality.

Of course, the ideal condition is to have first class quality coupled with first class selling ability, but this nice combination is seldom reached in the faulty old world of ours. The most important feature is, in my humble opinion, to keep on improving your product until you succeed in turning out a genuine, uniformly high grade quality product.

Then, and not until then, can you become really enthusiastic about it. You will find this enthusiasm a powerful aid toward selling your product. If your product is not of such high quality that you are forced to wax enthusiastic about, then you will find it hard to make sales, because no honest man can work up any enthusiasm about a product he knows is not good. If you don't more than half believe in your product, how in the world can you expect to make any other man believe in it?

I now want to tell you just a little about our trim stone. We have as the result of many costly experiments, developed a system and molds for the manufacture of a really high class, reinforced, precast and concrete trim, for which we are getting prices nearly if not quite equal to the price of Bedford stone trim. Many architects and builders have stated to us that our trim is equal in appearance and quality to Bedford limestone, some few have expressed a preference for our trim, on the ground of its being stronger and more waterproof, consequently more stain proof. We have been favored with many good sized orders for trim, even on jobs where our blocks were not used. The largest single order we have had was one amounting to sixteen hundred dollars, for the trim alone. Also many other orders ranging from about fourteen hundred dollars, down to about eight hundred dollars, for each job, with of course the larger number of orders costing less money, for ordinary buildings.

This is a vastly more profitable line than concrete block, because we are competing with a naturally high-priced material. In the trim line, you do not have to make a low price to get the business but you most emphatically do have to make a good product.

*Speech made at Wisconsin Concrete Products Manufacturers Convention, Milwaukee, Wis., February 20th and 21st.

Concrete Girder Bridge

(Continued from page 16)

ferdam of sheet piling was constructed for each pier and kept unwatered with a small centrifugal pump. The excavation was carried down to rock where there was gravel overlying and the soft rock was stripped off. Forms were constructed for the footings inside of the cofferdams and the water was kept pumped up till the concrete had been placed. This method permitted careful inspection of the foundation and there was no uncertainty as to the quality of the concrete and its bearing on the rock as there would have been if the concrete had been placed through water.

The original intention was to pave the roadway with asphalt but during construction it was decided to lay a 3" brick pavement and the height of the curb was slightly increased.

Concrete lamp poles of crushed white marble and grey cement with fixtures conforming to those used along the adjoining streets are to be placed on the rail piers above the double expansion columns. These poles are being made by the Massey Concrete Products Corporation by the centrifugal process. This process is being used quite extensively for a variety of concrete products and is an interesting development. For the poles, a cast iron mold is used which is split in two parts longitudinally. The reinforcement for the pole is built up and placed in one-half of the mold with buttons of mortar wired to it to keep it the proper distance from the furface. The mold is then bolted together and the proper amount of warm concrete to make the hollow pole is poured into the end. The form is sealed and run into a machine which spins it rapidly for a few minutes on a horizontal axis till the concrete is solidified against the mold and a hollow cove is left through which the excess water is drained. The mold is placed in a steam tunnel for a few days for curing, at the end of which time the mold is stripped and the surface of the pole is brushed and washed. When properly controlled, this method produces very dense and durable concrete.

The Shirland Avenue bridge was designed in the Milwaukee office of Hool & Johnson for the Public Works Committee of Beloit, Wisconsin, of which Mr. G. E. Heebink, City Engineer, is chairman. The contractor was John Schneiberg of Beloit. The contract price was $23,990.00 exclusive of the backfill and grading at the abutment and the brick paving.

Concrete Slabs Replace Old Bridge Floor

By H. W. WOODILL

Civil Engineer, Holyoke, Mass.

Maintenance charges on the wooden floor of a bridge spanning the Connecticut River had become so heavy in 1921 that the town of South Hadley, Mass., decided to replace the old floor with one of better wearing qualities. This decision was carried out in the spring of 1922 when, without taking the bridge out of service, it was improved with a new floor of precast concrete slabs. The bridge connects South Hadley with the city of Holyoke and is maintained in part by each municipality. The slabs were cast with such

When the slabs were ready to be placed they were jacked up onto a frame of heavy timbers mounted on two low wheels.

A five-ton motor truck assisted when necessary by a 10-ton Holt caterpillar tractor, hauled the frame carrying an 8½-ton slab to the bridge.

care that although they were 8 by 20 feet in size and weighed 8½ tons each, an excellent fit was obtained when they were placed. As no short detour was available, traffic continued to use the bridge during construction, the cartrack strip at one side being used in passing the point where the slabs were being placed.

Creosoted wood blocks laid on four-inch chestnut planks made up the old floor on the east end of the bridge. After eight years' wear the surface was so uneven that a new floor was necessary. Decision was made to pave with concrete because of its durability. Precast slabs were chosen so that traffic would be hindered as little as possible.

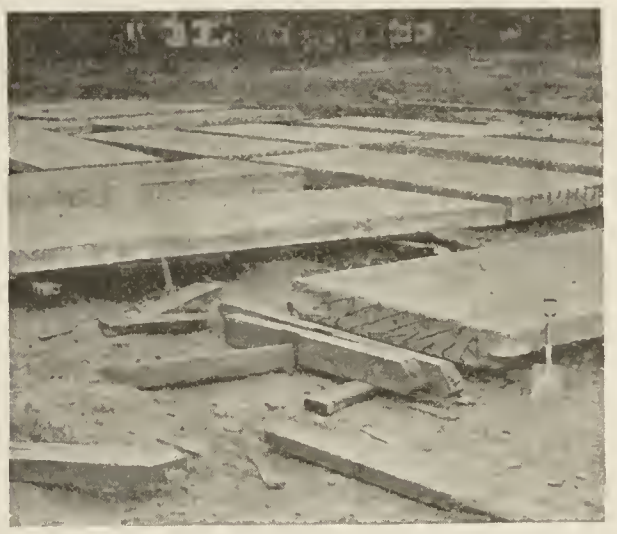
Two 160-foot spans of double intersection type trusses make up the South Hadley end of the bridge. These were found to be strong enough to support the additional weight of the concrete but the floor system needed strengthening. This was done by putting in enough girders to cut the original 16-foot floor beam spacing in half. The new beams are fastened by standard plate connections to hangers where the web members intersect midway between panel points.

The concrete slabs are supported by

The use of precast slabs permitted the installation of a new, permanent floor in this bridge at Holyoke, Mass., without interrupting traffic.

the stringers, which rest upon the new floor beams, 4-foot on centers, and come into the old beams. By casting each slab with a recess along one bottom edge, the contractor made provision for clearing the old floor beams, which extend above the top of the stringers. Slabs were placed with their long dimension across the roadway.

Flat arch construction was adopted, the slab bottom being recessed transversely to form arches of four-foot span. Small longitudinal beams four inches wide were carried through the arches. Reinforcement is ample to carry the assumed load even though there is no bearing on one stringer. The slab thickness varies from 13 inches at the ends to about six inches at the arch crowns.



The slabs were cast in carefully prepared molds in which the floor system of the bridge was exactly duplicated.

In preparation for casting the slabs careful measurements were made of the floor system and accurate levels taken. The bridge is on a slight skew, which further complicated matters. The plan of the floor system was duplicated at the casting yard not far from the bridge with steel shapes set in the same positions as the stringers and floor beams. Sand carefully leveled constituted the bottom of the mould. Wooden arches were set on the sand to form the arched recesses in the slabs. Concrete was placed in the forms early in the fall of 1921 and the first slabs were installed the following May, so that an ample curing period was allowed.

From Concrete Highway Magazine.

CEMENT AND ENGINEERING NEWS

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The Tides of Humanity

One of the surest signs that the wave of unemployment has receded is the pronounced movement of the laboring element to those centers where activity is in full swing. In our own country it is shown in the movement of Negro labor Northward. The Negro exodus is assuming such proportions that the South has become alarmed for the safety of the crops which have never been satisfactorily handled except by Negro labor. In Europe the surplus labor is crowding the ships and trains in the movement from one country to another. Sweden is especially alarmed at the tendency of its artisans and farmers to emigrate to America which would gladly absorb these desirable aliens into its population. France and Italy are bickering on the terms at which France can employ Italian immigrants who are to take the place of French labor destroyed by the fortunes of war. In England the unemployed are still a problem although there are signs that in that country also work is being found in sufficient quantities to ameliorate the situation.

In short the signs point that labor will shortly be at a premium, not alone in Europe, but in America as well.

Previously this shortage of labor had been overcome by immigration. We took from Europe the surplus labor existing there and used it here. Now we cannot do that because of the present laws restricting immigration.

The big industries of the United States have not been blind to this fact. In Washington the law regulating immigration has been under fire. Immigration is regulated by what is called the Johnson bill which became effective on June 1st, 1921, and is operative until June 1st, 1924. It restricts the immigration from Europe to three per cent. of each nationality registered in this country as shown in the census of 1910. It was enacted to reduce the number of immigrants and has been found to be very effective. During the twelve months ended with June 1, 1922 the net immigration was but 88,250 a surprisingly small number when compared with the records of the years before the war.

The war showed us that loosely regulated immigration was not the most desirable thing for the good of this nation. Foreign born citizens in many cases, were of us but not for us. We found that instead of being a nation we were merely a collection of nationalities. Each nationality naturally sided with its fatherland in the struggle then going on in Europe. This meant an internal conflict of interests among us that had to be suppressed with an iron hand by those of us who were truly American. The Johnson law was one of the ways in which the iron hand operated.

We do not believe that the Johnson law has failed in its object. It has certainly caused us to be more cautious in opening our gates to the stranger. We believe it is a good law that should neither be shelved nor emasculated because of expediency. We believe that if it is necessary to amend the law in order that our industries be supplied with labor that the amendment should be explicit in that we get labor and not immigrants who do not labor. The amendment should also be explicit that the alien should be of a quality that would desire and could qualify for citizenship. If he cannot or will not do that he will be a decided loss instead of a gain for this nation.

It takes time to make or to amend laws and in the meantime we have work to do. Everywhere in the country industry is slowly but surely assuming its old time swing. The factory chimneys are smoking, the railways have more than they can handle and big projects which were suspended because of the after-war slump are being resumed. The call for labor is insistent, our surplus is being rapidly absorbed and a shortage looms.

Much of this shortage will be overcome with machinery. The market for labor saving machinery will boom. The industry or the contractor who formerly depended on human labor will, inevitably, be compelled to resort to the machine and thus resorting they will learn many things that should have been common knowledge for them years ago.

Employment Demand Strong

The Employment Department of The American Association of Engineers reports that engineering services continue in demand in most sections of the country, particularly in the middle west, and the outlook for technical employment is active and favorable. There is an increased confidence that good business will continue. This will lead to more construction providing labor and materials are not beyond reasonable figures. A number of manufacturing companies, particularly road machinery, mining machinery, and similar commodities, are practically sold out for the first half year and many steel companies are sold out for part of the second half of the year, and the demand from railroad and construction companies is continuing. Hotels in the large cities are well filled with heavy railroad traffic. This promises to be the best year for the railroads since their release from federal control.

The demand for designing engineers is expected to continue for some time. The enormous amount of plans being prepared indicates an up-tone of strength and a large demand for construction engineers and estimators, for the immediate future. The outlook in building construction bids fair to continue vigorously for some time.

Engineering activities are starting to show signs of life in the northwest section where weather conditions caused a general pause. In California, engineering work continues good. The southwest section shows poor for the civil engineer but excellent in the mining field. The mountain states show an early spring start with a number of general engineering projects under way. The central states indicate a large volume of construction work, much of which is being rushed to completion and a large volume of new work being started. Building permits in Chicago for the month of January showed an increase in valuation of 125 per cent over January of last year, and similar large increases in other cities of the middle west. The coal mining region indicates continued activity with a fair demand for technical services. The southern states are showing increases in building construction with a fairly large road program in the most of the states.

Engineering work is not active in the eastern states, particularly New York and Massachusetts, and business is not as optimistic, although the supply and demand of engineers about balance.

Business—Where Is It?

Ever since the business inflation of the war there have been men who have been seeking for a recipe for greater volume of sales and profits than has been accorded most men in most industries since the "depression" of 1921. Having had a taste of easy sales and profits, these men have been spending their time and energy in a fruitless search for an elixir of business that would bring back to them that flabby, unsound prosperity of the war period. It seems incredible to them that times have changed; that with the return of the world to normal pursuits business has also returned to a basis whereby the sweat of one's brow alone can results be obtained.

Yet, while this number have been fuming and fretting that the good times have gone, others have been finding a new prosperity, founded upon the solid rock, that possesses promises of permanency both of duration and growth which that of the war period, built as it was upon the shifting sands of destruction, did not possess. These men, while they may complain at times of income taxes or prohibition, do not complain of changed business conditions, for they know by their own experience that the prosperity which they have earned since the war is in reality earned and sound, and cannot be swept away overnight by the signing of an armistice or the end of an international conflict.

Some of these men may tell you their prescription for developing business—they may tell you that it is a mixture of industry, service, foresight, and sound judgment. They may point out that they will not accept an excuse from their subordinates for failure to get business; that every one in their organization is made to understand that he must "deliver" or resign. And yet, having read or heard what they have to say you may be no nearer the secret of their growing successes than you were before and no nearer solving the problems that confront you in your business.

During the war period business came to those that offered needed commodities; now those commodities must go to the prospects for them. Business today is a "leg" business as contrasted to a "chair" business during the war. More and more those who are effectively meeting present day conditions are realizing the importance of taking their story to the public; talking to it in terms of industries, commodities, firms. The day has come when the publicity given to a commodity is no longer just of the thing offered; it includes the utility of the thing as well. Markets are being developed in practically every line of manufacture by developing new uses, or by acquainting new prospects with the utility which they may find in the commodity offered.

An actual experience is in point. The Bradley Knitting Mills, manufacturers of sweaters, swimming suits and other similar wearing apparel, found it impossible to sell swimming suits in Nebraska. "There isn't any place for persons to swim in that state" was the complaint of the salesmen in that territory.

"Too bad" said Bradley Tyrrell, general manager, "but we must sell your quota of swimming suits in Nebraska."

That was the problem. How did he solve it? By complaining that Nature was unjust because she did not place lakes and rivers in abundance in Nebraska? No—he wanted a market and he set about creating it in a practical, effective manner.

He wrote to the Portland Cement Association and obtained a thousand copies of a booklet describing the most approved method of constructing a swimming tank. With these he armed his Nebraska salesmen and sent them out as missionaries to induce municipal swimming pools. The result was immediately noticed; this town and that town began to build public tanks and the swimming suit business of the Nebraska territory has been growing steadily ever since. Undoubtedly the cement dealers and manufacturers owe a certain increase in business to the activity of the Bradley Knitting Mills in their determination to develop a Nebraska market for swimming suits, but the point to keep in mind is that for that company business is where it is created.

Yes, business is where it is created, and healthy business is not found any other place. Industry, service, foresight and judgment all may contribute to the creation of business, but they are, after all, only the instruments used in the process and it is the ultimate result, the creation, that is important. To create added business for your concern it may not be necessary to step over into the realm of another industry, as did the Bradley Knitting Mills, but, if you are not satisfied with the volume of business and your profit and loss sheet, there is but one remedy—go out and create more business.

A certain man applied for a position.

"We don't need a man," was the reply.

"No" said the applicant, "you may not need a man but you need me."

Then he proceeded to prove why they needed him, and prove it so conclusively that he got the job. He created his position.

Business—where is it? Where those in the business world have the vision to see a place for its creation—provided they have the wisdom to develop it through service and goods that merit reordering after the business has been created. And this created business, unlike the war-time variety, has the virility of soundness in its veins, a fit product to thrive and prosper in the stern atmosphere of present day conditions.

New Construction

According to the F. W. Dodge Company, contracts awarded in January in thirty-six eastern states (including about seven-eighths of the country's total volume of construction), totaled $242,755,000, an increase of 31 per cent as compared with January, 1922. Residential construction constituted 51 per cent of the total, or $122,695,000, an unusually high figure for this time of the year. Second in importance were business buildings, amounting to $36,332,000, or 15 per cent of the total. Other important items were $28,642,000, or 12 per cent, for public works and utilities; $23,152,000, or 10 per cent, for industrial buildings, and $16,862,000, or 7 per cent, for educational buildings.

The building permits filed in January at 136 cities, according to Bradstreet's, totaled $166,162,643, a sum 36.7 per cent above the values in the same cities in January a year ago, but only 11.7 per cent below December, 1922, the fourth largest month on record. In January last year, building activities, as judged by the

(Continued on page 32)

Building Outlook Is Bright

In a national building survey prepared by S. W. Straus & Co. of Chicago the following statements are made:

"New building permits, including alterations, in 215 principal cities of the United States for January were $209,664,167, indicating a total for the entire country of $294,000,000. Of these cities 185 are comparable with January, 1922, and show an increase for January this year of $52,472,212 or 36 per cent, their total being $197,649,059. Of these 185 cities, 132 made an increase this January and 52 either had decreases or about equalled their figures for January, 1922.

"A comparison of 200 of the 215 cities reporting this January shows a decrease from December, 1922, of $38,144,891—an unusually small seasonal decline for 200 important cities, which made a record total in December of $242,234,046. This low seasonal decline would tend to verify the prediction of many authorities that the building records for the entire country this year will exceed the phenomenal record of 1922.

"The Pacific coast cities made an astonishing January record, 15 out of 19 showing substantial increases over January, 1922. In the Eastern cities the proportion of increase was not so great, showing 42 increases against 27 decreases.

"The principal Southern, or South Atlantic cities' records, show 18 increases and 7 with decreases compared with January, 1922. Among 70 central cities 58 show increases and 12 decreases.

"The Borough of Brooklyn, New York, made a larger gain in January than any separate city in the country, with a total of $18,243,147, or 135 per cent.; a larger gain than all of the Boroughs of New York combined, Manhattan showing a loss of $4,795,368 and pulling Greater New York's January gain down to $16,411,981.

"Eight large cities showed gains of more than $2,000,000 compared with January, 1922, as follows: Chicago, $10,620,050; Cleveland, $3,481,950; Detroit, $2,549,896; Los Angeles, $3,283,349; Louisville, $2,998,625; New York, $16,411,981; Philadelphia, $2,092,780; Washington, D. C., $2,121,411.

"Seven other cities made gains of more than $1,000,000 as follows: Indianapolis, Ind., $1,512,432; Newark, $1,012,697; Pittsburgh, $1,275,096; Pittsfield, Mass., $1,658,105; St. Louis, $1,450,796; Springfield, Mass., $1,038,455; Tacoma, $1,238,334. Gains of more than $100,000 were made by 63 other cities.

"The building material price situation for the country at large did not point radically in January toward a decided increase or decrease. Prices on many materials varied according to locality, indicating influences which related largely to local stock on hand and freight conditions. Large builders who keep in close touch with prospective material prices, and who have construction projects in hand, were not delaying completion of their plans with even the hope that prices will soon change to any great extent."

New Way to Measure Sand

The reliability of concrete construction is likely to be increased, and the cost in some cases reduced, by the application of a newly developed method of measuring sand, which is now being tested at the Bureau of Standards of the Department of Commerce. The method has been termed the "inundation method" and consists of measuring sand in a container which has been partly filled with water before the sand is put in, so that when the sand is in, the water is up to the top and the sand completely soaked.

The volume occupied by a given amount of sand when shoveled into a measuring device varies with the moisture content of the sand; the difference in measuring volume between dry and moist sand being usually from 10 to 15 per cent and occasionally running as high as 50 per cent. But it is found that if the sand is completely soaked or "inundated" uniform measuring results can be obtained no matter how much the original moisture content may have varied.

In making concrete the proportions of cement, sand, stone, and water are so chosen as to get the required strength and workability with a minimum of cement, since the cement is the chief factor in the cost. Inaccurate measurement of the sand may result in too large a proportion of sand, in which case the concrete is to weak; or in too small a proportion of sand and hence a concrete too rich in cement. But this rich concrete is not necessarily stronger than the concrete the contractor intended to make, for the sand has brought in some water in addition to that which is added on purpose; and if this extra water is not allowed for and the amount of water added correspondingly decreased the concrete will contain too much water. It will be sloppy and when set will not be dense enough to give the necessary strength. The contractor therefore is merely wasting cement and doing good to no one.

It is hoped that with the inundation method it may be possible to specify concrete by the strength required rather than by arbitrary proportions. The contractor can then find the proportions of the materials he is using that will give the requisite strength and can adhere closely to these proportions. The result will be a concrete whose proportions are more nearly what they were intended to be, and with which a lower factor of safety can be used.

Geographical Survey's 1922 Portland Cement Report

The statistics shown in the following table, prepared under the direction of G. F. Loughlin, of the United States Geological Survey, are based mainly on reports of producers of Portland cement but in part on estimates. The use of estimates was made necessary by the lack of returns from four producers.

Production, shipments, and stocks of finished Portland cement in December, 1922, and preceding months.

Month	Production (barrels)		Shipments (barrels)		Stocks at end of month (barrels)	
	1921	1922	1921	1922	1921	1922
January	4,098,000	*4,291,000	2,539,000	*2,931,000	10,300,000	*13,316,000
February	4,379,000	4,278,000	3,331,000	3,285,000	11,400,000	*14,142,000
March	6,763,000	6,685,000	6,221,000	7,002,000	12,000,000	*13,848,000
First quarter	15,240,000	15,254,000	12,091,000	13,218,000	.....	.....
					12,600,000	
April	8,651,000	9,243,000	7,919,000	8,592,000	12,450,000	*14,470,000
May	9,281,000	11,176,000	9,488,000	12,749,000	11,150,000	*12,893,000
June	9,296,000	11,245,000	10,577,000	13,470,000	———	*10,718,000
Second quarter	27,228,000	31,664,000	27,984,000	34,811,000	.....	.....
					10,414,000	
July	9,568,000	11,557,000	10,301,000	13,850,000	8,280,000	*8,433,000
August	10,244,000	11,664,000	12,340,000	14,361,000	6,953,000	*5,746,000
September	10,027,000	11,424,000	11,329,000	12,444,000	———	*4,724,000
Third quarter	29,839,000	34,645,000	33,970,000	40,655,000	.....	.....
					5,348,000	
October	10,506,000	12,287,000	12,114,000	12,854,000	9,091,000	*4,149,000
November	8,921,000	11,349,000	5,195,000	10,167,000	11,938,000	*5,320,000
December	6,559,000	8,671,000	3,697,000	4,858,000	———	9,134,000
Fourth quarter	25,986,000	32,307,000	21,006,000	27,879,000	.....	.....
					.....	
	98,293,000	113,870,000	95,051,000	116,563,000	———	.....

(*) Revised.

Stocks of clinker, or unground cement, at the mills at the end of December amounted to about 2,823,000 barrels compared with 1,949,000 barrels (revised) at the beginning of the month.

Quarry face before the shot.

Blasting at Bethlehem

Dynamite is Employed to Obtain the Lime Stone Used as a Flux in Making Steel by Both the Blast and Open-Hearth Methods.

When you think of Bethlehem you think of steel, ships and Schwab. But before the Bethlehem Company can produce the steel used all over the world in myriad ways it is necessary to obtain the limestone employed as a flux in smelting the iron ore. This limestone, which is blasted by explosives from quarries, is as essential to the ships that have made Mr. Schwab's one of the best-known names in the country as the iron ore itself.

In Bethlehem, Pa., a city settled by a group of Moravians who, seeking religious freedom, came there about two hundred years ago, there is a great steel plant. The Bethlehem Steel Co. was organized in 1857 as the Saucona Iron Co. It was later called the Bethlehem Rolling Mills & Iron Co. The first blast-furnace was blown in on January 4, 1863, and the first rails of puddled iron were rolled on September 26, 1863, four years before the discovery of dynamite. The plant first produced pig iron, cast iron, and wrought iron, and billets, rails, and other Bessemer steel products. Following the building of a gun factory and armor-plate plant in 1886, the company engaged largely in the manufacture of armor-plate, large guns, gun mounts, and gun forgings. In 1906, Charles M. Schwab took over the active management and began building the world's largest and most complete open-hearth rail plant, as well as the only American factory for the wide-flanged integral-rolled beams and columns. Today, with its subsidiary companies, owning iron mines, coal mines, quarries, railroads, and steamships, the Bethlehem Steel Co. controls the manufacture of its products from start to finish.

One of the raw materials required for making steel is limestone. It is used as a flux both in the blast and the open-hearth furnaces, and unites with the non-ferrous components of the ore to form a slag, which readily separates from the molten iron or steel.

At Bethlehem there are seven large blast-furnaces, more than thirty open-hearth converters, and three electric furnaces. During September, 1918, a record production of 95,049 tons of pig iron was reached. To do this more than 147,000 tons of iron ore, 79,000 tons of coke, 25,000 tons of scrap iron, and nearly 50,000 tons of limestone were consumed. In a normal year the various Bethlehem plants use about two millions of tons of limestone.

Across the Lehigh river, which runs past the plant, there is a limestone quarry from which stone is obtained for the furnaces. It was here that Hercules dynamite was called upon for a large shot, consisting of 51 well-drilled holes averaging over eighty feet in depth. These holes were drilled by "Clipper" drills, made by Loomis Machine Co., Tiffin, Ohio. It was a large and important shot, and it was also the first trial here of Hercules Special No. 1.

Firing a large quarry blast isn't as simple as it sounds or even as it looks in photographs. The holes must be carefully measured; the dimensions of the face and the volume of rock to be blasted must be carefully valculated from actual measurements; the quantity of explosive to be used per ton of rock must be decided upon; the charge

required for each hole must be estimated; and the best distribution of the charge in each hole must be determined. After this has been accomplished, the work must be done precisely as planned.

On the day preceding the shot all the necessary measurements were taken. Mr. Horlick and Mr. Barab of the Hercules Powder Co., Wilmington, Del., who represented their Service Division, and Boyd Hadesty, their sales agent of Allentown, Pa., sat up until the wee sma' hours to complete the necessary calculations and to check them.

A number of men connected with anthracite and quarry companies came to see the blast, among them Messrs. C. Wilson and E. H. Shainline of the Charles Warner Co., a firm that quarries large quantities of limestone in addition to M. L. Jacobs, manager of the Bethlehem Mine Corp., and Thomas F. Henson, superintendent of the quarry where the shot was made, the superintendent of the other quarries operated by the company were present. E. R. Wash is superintendent at McAfee, N. J.; R. Peacock at Steelton, Pa.; and C. R. Orndorff, at Hanover, Pa.

The service men of the Hercules Powder Co. whose calculations carried them past midnight, arose in time to start directing the loading of the holes at 7:00 a. m. A number of crews were organized to accomplish this work.

A dolly, which is a piece of wood about four feet long, attached to a rope, was used, first, for determining the condition of the holes and checking their depth before loading and, second, for tamping the charges and stemming the material. Sixty per cent. Extra L. F. was used in the bottom and Special No. 1 in the top of holes. Until the dynamite charge came above the water level, the cartridges were dropped into the hole without slitting them. After the water level was passed, the cartridges were slit and their contents poured in through large funnels which were placed in the iron pipes used for casing the collars of the holes. Hercules Special No. 1, in 4x12-inch cartridges, in the calculated quantities, was charged on top of the 60 per cent Extra L. F. In some cases, where the holes were too far below grade they were filled with screenings to give an average depth of the holes of about eight feet below the quarry floor. The rope by which the dolly was lowered into the holes was marked at 25, 50, 75, and 100 feet, so that the progress of loading could be judged at any time. To lower the cordeau, a cartridge of 60 per cent Extra L. F., 4" x 8", was fastened securely to the end of the cordeau and carefully lowered to the bottom of each hole. Then the dolly was let down to determine whether the cordeau had reached the bottom. The cordeau was then cut off about six feet above the top of the hole and securely fastened. Deck loading was employed wherever necessary; that is to say, the explosive charges in the holes were separated by layers of stemming where it was thought advisable. The distance of the holes from the face, the relative hardness of the formations at different points, the spacing of the holes, the total charge per hole, and the desired height of the charge in the hole, must be considered in deciding on the most advantageous deck loading. The experience and judgment of the man in charge must be relied upon in this phase of the preparatory work. If the charges are properly spaced in the hole, greater efficiency is obtained from the explosive and the rock is broken better for loading into cars. The work was done by four crews of about four men each, with a man directing each crew.

Loading the holes was a full day's job. It took sometime for the men in the different crews to get organ-

After the shot.

ized and to understand just what they were to do; as the day progressed the speed of loading increased. By the time the holes were all loaded and tamped, the quarry bench cleaned up, and the cordeau connections made, it was after six o'clock.

Then came the blast. One electric cap was connected to the end of the cordeau and fired by a blasting machines. Like a pile of building blocks pushed over by an impatient child, the great quarryface tumbled down, the rocks spilling over one another and settling at a comfortable angle of repose at the base. The nearby highway, railroad tracks, and high-tension transmission line were not touched by flying rock, so correctly had the charges been calculated. By this shot 22,000 pounds of Hercules dynamite broke down 83,671 tons of limestone, or almost 4 tons of stone per pound of dynamite.

No thinking person can fail to pause for a moment's deep reflection when he sees nearly 100,000 tons of stone broken down in an instant into pieces small enough to be loaded into cars. It is an overwhelming demonstration of the power of dynamite—the great constructor of civilization—which has been so aptly termed by Mr. Bacchus *the New Aladdin's Lamp.*

Prosperity Is in the Offing

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offing. Demand, we know, is going to be good—if it follows the curve of previous experience it will approximate more than 135,000,000 barrels. Raw materials, including the all important fuel, will be available in ample quantities and reasonable in price. The means for prompt transportation from producer to consumer will be available. It remains only to be seen the extent to which the various elements of the industry will avail themselves of these portents of prosperity.

The final link in the commercial life of cement, the distributor, apparently has easy going ahead. He has an assured market and an assured supply. The degree of his prosperity will be limited strictly by his merchandising ability. Exactly as he avails himself of his various sales helps, as he keeps himself informed on trade matters and as he sells his commodity rather than waits for orders, so will he prosper.

A Long Concrete Flume

A stupendous piece of construction in Alberta, Canada, is the Canadian Pacific Railway Company's great dam on the Bow River at Bassano, a development in the Canadian Pacific's irrigation project for the colonization and development of western Canada which typifies what a railroad can do to enrich a country. This dam, which feeds the irrigation ditches of what is known as the eastern irrigation block, is of earth and concrete construction. The earthen embankment has a maximum height of about 45 feet, a total length of over 7,000 feet and width of base of 350 feet at its highest point. It contains 1,000,000 cubic yards of material. The upper slope is paved with concrete slabs; the spillway proper, of reinforced concrete, is 720 feet between abutments with a maximum height of 40 feet to the overflow crest. It contains 40,000 cubic yards of concrete and 2,500,000 pounds of steel.

Brooks aqueduct, a link in this company's irrigation system, is a unique piece of engineering built to convey water from Lake Newell across a valley between the Bow and Red Deer rivers. This was accomplished by constructing a concrete flume, a curved shell suspended between horizontal girders, the whole supported by a reinforced concrete trestle. Structurally it is very economical for, when full, the shell is in simple tension, free from shear and bending moments. This aqueduct is 10,480 feet long with a water cross-section of 126 square feet, carrying 900 cubic feet per second. Its construction consumed 5,000 cubic yards of concrete and 4,000,000 pounds of steel. In order to cross the Canadian Pacific tracks, the aqueduct was converted into an inverted syphon passing under the tracks, thereby inaugurating a new idea.

The company's irrigation project in Alberta is designed to serve something over 2,225,000 acres of land, of which over 740,000 acres have already been supplied with water and are under cultivation.

Brooks acqueduct taking a nose dive under Canadian Pacific tracks in southern Alberta.

News of the Concrete Products Factories

Tell City Sand and Gravel Co., Tell City, Ind., wants prices and catalogs on molds for making concrete blocks and tile.

Morris & St. Laurence Cement Brick Co., 24 Manchester St., Fall River, Mass., frame factory building was destroyed by fire.

New England Concrete Products Co., W. J. L. Roop, manager, 161 Devonshire St., Boston, Mass., operate Otto Walter roofing tile machine, Ideal block machine and Blystone mixer. Want prices and catalogs on machines for making drain tile and wet poured culvert pipe, also interested in mica spar crystals, white sand, marble chips and white cement.

Gibraltar Stone Works Inc., 5 Hopkins Place, Baltimore, Maryland, has ben incorporated with a capital of $10,000 by Eugene Rosenblatt and Joseph W. Ascher.

J. B. Davis Concrete Products, 901 Davison St., Charlotte, N. C., will erect a factory 50x150 feet, where they will manufacture concrete products, septic tanks. Want prices and catalogs on roofing tile, building blocks, floor tile, culverts, vases, drain tile, park bench, septic tanks, fence posts and flower boxes.

Z. B. Weathers & Son, P. O. drawer 538, Shelby, N. C., operate a Christopher block machine, Helm brick machine, Jaeger and Christopher mixers. Wants prices and catalogs on molds for making roofing tile, building blocks, chimney blocks, floor tile, burial vaults, vases, drain tile, sewer pipe, flower boxes, also interested in mixers, crushers, cement sack baler and waterproofing compounds.

John P. Leising, East Amherst, N. Y., wants prices and catalogs on molds for making building blocks, burial vaults and sewer pipe; also interested in marble chips and waterproofing compounds.

Cement Products Co., E. H. Pearl, President, E. A. Buchanan, Secretary, Roanoke, Va., has been recently incorporated with a capital of $30,000. Operate a roofing tile machine made in accordance with their own patents. Wants prices and catalogs on machines for making building blocks. Writes us as follows: "We make roofing tile only at present but expect to make building blocks in the near future and possibly other cement products."

Hiddenite Crushed Stone Co., Hiddenite, N. C., wants prices and catalogs on molds and other necessary equipment for making concrete drain pipe 12 to 48 inches.

Kabell Concrete Products Co., S. E. Cook, President, Huntington, W. Va., has been incorporated with a capital of $25,000.

Maynard Cement Tile Works, Maynard, Minn., operates an Anchor block machine and tamper, Quinn drain tile machine, Anchor silo molds and Blystone mixer.

C. Kristufek, 300 Park Ave., Ambridge, Pa., wants prices and catalogs on machines for making silos, roofing tile, building blocks, building and partition tile, chimney blocks, floor tile, culverts, vases, sewer pipe, porches, fence posts, flower boxes and brick. Also interested in mixers, mica spar crystals, white sand, marble chips, waterproofing compounds, white cement and portland cement.

Walter Van Horn, St. Clairsville, Ohio, will begin the erection of a cement block and pipe factory shortly.

Frazier Drain Tile Co., Bluffton, Ind., has been recently incorporated with a capital of $75,000 by L. M. Frazier, W. H. Frazier and E. V. Frazier, to manufacture tile and blocks.

D. J. Rober & Sons, 207 Sixth Ave., S. W., Mandan, N. D., operate a Helm block and brick machine and a Waterloo mixer. Wants prices and catalogs on mixers. Writes us as follows: "I am interested in all kinds of facing materials and intend to add machinery as fast as trade will permit." Is interested in mica spar crystals, white sand, marble chips, waterproofing compounds and white cement.

C. Peters, 808 Chestnut St., Philadelphia, Pa., advises us he is in the market for second hand concrete products machinery.

Los Angeles Concrete Tile Co. has purchased a site 450 feet fronting on Freemont Ave., running back to Southern Pacific Railway, Alhambra, Calif., and will erect a $50,000 factory thereon. The company now operate a small plant at Monterey Park, Calif. M. G. Wainkine, President, Harry Soderberg, Manager.

White Concrete Products Co., 413 Market St., Camden, N. J., has been recently incorporated for $500,000.

Lilley Concrete Products Co., 143 Woodlawn Ave., Aurora, Ill., has been recently incorporated with a capital of $75,000 by L. W. Lilley, of 143 Woodlawn Ave., Wm. H. Sperry of Batavia, Ill., and John S. Byrne, 317 Columbia Ave., Aurora, Ill., to manufacture brick, blocks and building materials. Operate a Wert block and brick machine. Wants prices and catalogs on machines for making roofing tile and floor tile. Also interested in mica spar crystals, white sand, marble chips, waterproofing compounds and white cement.

B. W. Waycott, 481 S. Lincoln St., Denver, Colo., is thinking seriously of making concrete products such as roofing tile, building tile and laundry tubs.

Burke Concrete Stone & Sand Co., Burke, S. D., operate a C. S. Wert block machine and tamper, Helm brick machine and Blystone mixer. They contemplate making burial vaults, roofing tile and drain tile in the near future and wants prices and catalogs on machines for making same. Wants prices and catalogs on septic tank making machines and cement sack baler, mica spar crystals, waterproofing compounds and white cement.

The Concrete Pipe Co., Kelso, Wash., will install a large plant near Longview in connection with the Long-Bell Lumber Company's developments at Longview.

New Construction

(Continued from page 27)

issuance of new building permits, reached their peak for this mid-Winter month with values more than twice as great as in January, 1921, so that the large mid-Winter increase this year is phenomenal in character. Nearly all the large cities in the United States report gains as against the corresponding period a year ago. The average monthly expenditures for building permits throughout 1922 were $208,000,000, and when all returns are in for January, 1923, the total will probably be little if any, below last year's monthly average.

News of the Cement Mills

John W. Boardman, vice-president and sales manager of the Huron & Wyandotte Portland Cement company, who sharply criticised city officials for buying cement at $4.09 a barrel, declaring that price unreasonable, will be asked to appear before the Detroit city council next week and give his idea of a proper price for the city to pay.

An addition to mill No. 6 of the Buffington, Ind., plant of the Universal Portland Cement Company, promised by officials of the cement company, so as to eliminate the dust nuisance, about which East Chicago, Ind., citizens have been complaining, will halt the proposed legal proceedings by Mayor Frank Callahan of East Chicago to restrain the company from operating mill No. 3, said to be without dust collectors.

Property has been damaged in East Chicago by the so-called dust nuisance, it was declared by Mayor Callahan. He proposed to have a restraining order issued on the grounds that the dust from mill No. 3 damaged his property.

The addition will enable the company to dismantle mill No. 3 and maintain the usual production.

Dust collectors for the alleged faulty mill would cost a great sum of money, it was declared by the cement company, while the addition to the improved mill would pave a way to eliminate the alleged nuisance and satisfy the property owners of East Chicago, who have claimed the dust from the plant is damaging their property.

Fire, which threatened to destroy the entire plant of the Louisville Cement Company, at Speeds, Ind., destroyed the brickment building of the company. The loss is estimated at $350,000, and is covered by insurance. The plant of the company is valued at $2,000,000.

The brickment plant, recently constructed, contained new machinery throughout for manufacturing a patented brick layers cement. The wind veered when the flames were approaching the office building and saved that structure, also making it easier to save the Portland cement plant, across the creek.

Several large warehouses were on fire, including one which was built of reinforced concrete on a site of a storehouse which burned down last winter with a loss of $80,000. The damage to them is uncertain, as some of the contents were damaged by water.

Heroic work held the fire back and in face of great danger workmen shut off and saved some 20,000-gallon tanks of crude oil. Three other tanks were burned up, but fortunately there was no explosion.

The cause of the fire has not been determined. One theory is that hot cement in the hoppers over the main building caused the fire, but the general opinion is that it started in the floor of that building.

The mills have been in operation more than forty years and formerly made hydraulic cement, but for the last fifteen years have been manufacturing Portland cement, and later the brickment plant had been established.

The Texas Portland Cement Co., Dallas, Tex., has increased its capital stock from $1,000,000 to $2,000,000.

The Acme Cement and Plaster Co., St. Louis, Mo., has increased its capital stock from $1,000,000 to $2,000,000.

The Marquette Cement Manufacturing Co., La Salle, Ill., has increased its capital stock from $700,000 to $7,000,000.

The State Cement Commission of South Dakota, A. C. Hunt, secretary, has purchased a tract of land at Rapid City and will soon begin construction of its plant.

The Signal Mountain Portland Cement Co., Chattanooga, Tenn., has elected the following: J. L. Senior, president; C. S. Steward, vice-president; R. A. Law, secretary; J. P. Hoskins, treasurer.

The Cape Girardeau Portland Cement Co., Cape Girardeau, Mo., reports that recently its shipment for one day reached 12 carloads. This is the largest shipment made in one day for several months.

Spokane, Wash.—E. B. Sherman, mayor of Boise, Idaho, and other Idaho men, have incorporated a $2,000,000 corporation to manufacture cement in Oregon, near Huntington. The corporation will be known as the Columbia Cement Co., organized in Nevada. The company has 500 acres of ground and the plant will have a capacity of 1500 bbl. a day.

The Portland Cement Association announces the opening of a new district office, effective February 1, in the Hibernia Bank building, New Orleans. This increases the list of association district offices to 25. Association work in Louisiana and Mississippi will be directed from this office. The district engineer in charge of the New Orleans office is John E. Tate, formerly of the Atlanta office as field engineer in North Carolina. Prior to joining the association staff, he was for two years resident engineer with the Road Commission of Maryland, and for three years assistant engineer, Delaware Highway Department.

Columbia Cement Company, Fred A. Ballin, President, Sixth floor, Concord Building, Portland, Oregon, contemplates building a 1500 bbl. cement plant on its holdings west of Huntington, Oregon. The engineer who will design and build this plant is J. N. Webster, care the Columbia Portland Cement Co., Concord Building, Portland, Oregon.

The Marquette Cement Mfg. Co., Marquette Bldg., Chicago, Ill., has purchased a large piece of land on Elston Ave. and the Chicago River, upon which the world's largest cement warehouse will be built. L. E. Ritter will be the engineer in charge of the construction.

An appropriation of $5,000,000 for the construction of a state owned cement plant in Illinois will be asked in a bill submitted to the State Senate by Senator Richard R. Meents of Ashkum. The University of Illinois has been making investigations of cement producing beds in the state for the past two years and it is the intention to build this plant during the coming two years.

Riverside Portland Cement Co., 762 Mills Bldg., San Francisco, Calif., has increased its capital stock from $5,000,000 to $6,500,000. Wm. G. Henshaw is president and Wm. H. Metcalf, secretary.

Hermitage Portland Cement Co., John C. Vance, President, 174 N. Third Ave., Nashville, Tenn., let the contract for the erection of a plant with daily capacity of 2,000 bbls. cement or 600,000 bbls. annually. The contract for the principal machinery was let to Allis Chalmers Mfg. Co. R. T. Miller will be general manager of the plant.

Progress Photographs

(Continued from page 23)

along, they might have gone far toward proving or disproving culpability. This was a case of a falling wall; and wherever the picture system is used at regular intervals in construction work, accidents involving injuries and fatalities can usually be interpreted by experts to place the blame on the right person. Knowledge that a picture may incriminate, furthermore, has a tendency to make for better and safer construction.

All along the line the value of periodic picture records is indisputable. Individual features of construction can be brought out, as for example the reinforcing steel for concrete. Where floors must have a certain supporting strength to hold cement or other heavy material, photographs can be used to a nicety. The questions that may arise are almost unlimited; and it is daily being brought home that the limit and range of what pictures can do is steadily increasing.

Beyond the limit of questions that may arise, are the further facts that pictures may serve as a substantiation of reference, or as illustrations for advertising, as a means of keeping office employees in touch with varying conditions on different jobs, etc. Pictorial exhibits of work done are interesting and convincing. Architects are using them more day by day in every way. Such a thing as the negotiation of a bank loan with photographs is not unheard of these days.

A large contractor has summed up the uses of photography in its application to construction as follows:

"For indisputable records of the condition of adjoining buildings before starting work, and after its completion.

"Photographing cracks over doors and windows and in other places to show whether or not any settlement has taken place, due to the construction work involved.

"For records to be available in case of a law suit or discord or misunderstanding.

"For advertising purposes.

"Posing as though on parade should be taboo in process photographs. The pictures should have life in them if possible; and when men are on the job at the time of photographing, have them shown as actually at work. All negatives should be dated and numbered. Prints should be unmounted; the notation on each must include the proper contract number, the serial number and date. Special stress is laid on the value of obtaining pictures at the time of any accident. Lots of things can and usually do happen on the scene of any accident, shortly after it occurs, which may make the value of a later picture as evidence disputable."

In connection with the photographs of the Drake Hotel, Chicago, which are used to illustrate this article, it will be noticed that they were all taken from a fixed position. That idea has been thought so much of that, in one case an engineering firm erected "shooting" towers at each of the four corners of a rectangle and had all its views taken from those four points. By sighting on the other towers when taking pictures from one, the photographer could make his directions almost as accurate as if he had used a transit.

The Drake, as every Chicagoan knows, is one of the city's most attractive and popular hostelries. Since its completion a radio station, operated by the Chicago Board of Trade, has caused a good many thousands in distant places to wonder what "The Drake" looks like. The last picture in this series tells. The others, fifteen in all, were taken at monthly intervals; and you can bet in this case the contractors knew that progress was being made.

Pennsylvania Crusher Company Opens Chicago Branch

The Pennsylvania Crusher Company of Philadelphia has recently opened a district office in Chicago in charge of C. S. Darling. Temporary quarters have been secured at the Monadnock building, but after May 1st the office will locate in the new Illinois Merchants Bank building.

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Cement and Engineering News

Vol. 35 Chicago, APRIL, 1923 No. 4

The Construction "Boom" and Its Meaning

Present Activity in Home Building Brings Present Prosperity to Cement Makers and Builders of Cement Machinery—A Diagnosis and a Prescription

Signs of the times which point not only to enormous possibilities for makers of and workers in cement are also indicating equal chances for prosperity on the part of makers of cement making and concrete handling machinery. The most unprecedented building "boom," particularly domiciliary structures, is not only under full sway but is being given added impetus by the new institution known as the "Own Your Home Show," which is exemplified by the ones just held in Chicago (a description of which is given in a parallel column of this issue) in Cleveland, Pittsburgh and New York.

The psychology of the human race aids and abets the building spirit. A primal instinct of mankind, second only, perhaps, to the mating instinct, is that of home seeking. Every man has an inborn desire, not only for a comfortable place in which to live, but for proprietorship in that place, and the independence that such ownership gives. The pressure of economic circumstance, particularly in the great cities, has given added attraction to home ownership.

What this means to the various phases of the cement industry is easily seen. Almost every structure built employs concrete in some part of its construction. Many homes, in constantly increasing proportion, use concrete as the major construction material. Hence, all this construction going ahead and all that will go ahead means added cement consumption. Further, every job on which cement is used means the use of a concrete mixer and handling device. Every added barrel used in the year's construction work means added concrete making machinery. The use of these machines means that new ones will have to be built to supply increasing demand and to replace the worn ones.

Not only are the cement maker, seller and artizan interested in the building boom, but it is also a matter of vital moment to the cement making and concrete handling machinery makers. As these "Own Your Home Shows" are a phase of this "boom", and a phase which serves to increase the desire for homes and thereby increase the volume and prolong the life of the "boom", each of these various elements, the cement maker, seller and artizan and the builder of cement making and concrete mixing and handling machinery should be keenly interested in the movement.

Of these elements, the machinery maker is perhaps the one farthest removed from the scene of actual activity, yet he is the one most vitally interested, for, without construction in sustained volume, the demand for new machinery to meet increased use and to replace worn out equipment would rapidly decline, and with the shrinkage in demand would come a slump in the machinery makers business. It is, therefore, in order to study the various phases of our present day activity in housing construction, including the "Own Your Home" movement and its causes and effects, from the standpoint of the machinery maker.

Such a study should cover three major angles: What are the causes of the present construotion activities in housing facilities? How can the machinery maker best cause this activity to redound to his own financial benefit? and what relation should the machinery and equipment manufacturer maintain toward the motives behind such activities as the "Own Your Home Show"? The scope of the present article will permit only a cursory touch on each head, but may point the way to deeper study and some real accomplishment in the future.

First, as to the causes of the present construction activities, particularly in home building, since that is the phase of the industry which we are now considering. These causes are not hard to find, and are probably sufficiently well known to justify but scant mention here. In the first place came the withdrawal of man power and material supply from the peaceful arts and their diversion into war uses during 1917 and 1918. No one can begin to estimate the actual physical retardation placed on home building by this enormous upset to the normal activities of the nation. It is sufficient to say that it was gigantic. Then, due to the same cause, came the great influx of population to the cities, during these same years and in the biennial period immediately following. This movement from the country to the urban centers was so great that it has been estimated by competent authorities that enough vacant country homes were left in two of the New England states, alone, to more than supply the entire housing shortage of the city of New York in 1920.

The return of the soldiers from overseas and the disbanding of our armies, the transplanting of thousands of country boys to the ship yards and munition plants and a hundred other causes led to a sudden increase in the population of the cities. An increase so great that, from a normal growth of about two or three per cent a year, the population of many of our metropolitan communities leaped upwards ten and even twenty per cent in each twelve-month. Housing construction, instead of keeping pace with this growth, actually lagged far behind what had been the previous normal rate. Then, following the war, came labor troubles. From coast to coast labor endeavored to take advantage of crowded conditions by gaining wage increases which were, to say the least, fortuitous. Building was thereby wholly stopped over a great portion of the nation, or so seriously impeded by reason of unreasonable costs, as to be negligible in volume.

These troubles settled or compromised, it was left for the landlords to add the final touch to the making of conditions which culminated in the now existent record demand for individual homes. Their unprecedented avarice placed the average renter in a position where he could build or buy a home on a less expenditure per month or per year than he could rent. Therefore, literally thousands of families who never before considered home owning a possibility are now recognizing the fact that it has become an economic necessity.

The recitation of these facts are not without point although most of the trade are familiar with them and it is well to state here the reason for their enumeration. It is to show that the present great activity in home building is the result of a series of circumstances running over a period of six years or more. It is to invite attention to the fact that, if properly fostered, the current "boom" can be made to run a course of years; indeed, it will take some chain of events of a magnitude similar to those above to put a stop to it. It is to demonstrate to the maker, vendor and artizan of cement and cement products, and to the manufacturer of cement making and concrete mixing and handling machinery that their present prosperity is not fleeting, but rather of a permanent nature, dependent only on the manner on which the present situation is met and future contingencies of demand provided for. This leads us to the second angle of the discussion.

How can the machinery maker best cause this activity to redound to his own financial benefit? The answer to that question may be phrased in one sentence —by adequately preparing to meet the continuing demand for equipment to cope with the situation. It is a lamentable fact that the cement industry, in all its branches, has passed through a lean period. In that it is by no means alone, as every branch of industrial develop-

ment in America has recently been in a similar position. This has given rise to what is probably a pardonable feeling of caution on the part of those who have their financial welfare involved in the industry. Such a feeling must not be allowed to so obscure the vision of the future and prevent adequate facilities to be provided with which to fill, in full, the nation's demand for cement and cement products.

One thing clear to the disinterested student of the present situation is that the only thing to stop the present activity, over a period of some years, is a dearth of materials or excessive prices for such materials as may be available. To use the language of the street, the industry is today "sitting pretty". The conditions which brought about this "boom" are not going to be, indeed cannot be, altered in a year or two or three years. This is evidenced by construction figures for 1922 from one city, Chicago. In this great muncipality in the past year over 7,000 dwellings, or their equivalent in apartment houses, were erected. In that period the population registered a net increase of about 10,000 families, and the year of record breaking construction left the city with a greater housing shortage, and a consequent greater demand for new homes, than before existed. Chicago's experience is merely typical. Add to this the fact that all industry is humming, all labor is busy, wages are high and prosperity is a recognized fact, and it is not conceivable that the existing activity is going to lag at any early date.

The way for the cement industry to insure continued prosperity over a period of years is to prepare to meet the peak of demand. The first individual upon whom this duty lies is the cement manufacturer himself. He must not restrict his output to the day's demand but must build up stocks of finished product to a point where temporary interruption, either to manufacturing or transportation will not embarrass the industry. He must prepare his plants to meet the increasing demand, to obviate a shortage which would tend to elevate prices and thereby discourage the builder with either threatened or actual cost increases. He must instill in his own mind a confidence proportional to the security of his position, and must predicate his operations on that confidence. He must manufacture and make available to the construction industry cement in sufficient volume to meet the ultimate demand, and he must inform the industry that such is being done.

The machinery man's job is largely one of co-operation with the owner of the mills, in building and making available all machinery and equipment which will be needed in carrying out the program of the mill. He must, on his assignment to cooperate with the cement manufacturer, do all those things enumerated in the foregoing paragraph as the duty of the cement maker.

The last question, — what relation should the machinery and equipment manufacturer maintain toward such activities as the "Own Your Home" movement is not so easily answered, and any answer thereto may be admitted to be controversial. It will be accepted as an academic fact that all activities which tend to increase public interest in home building redound to the general benefit of all phases of the construction industry. Admittedly, the cement machinery business is a phase of the construction industry as, with no construction, there would be no demand for machinery. The "Own Your Home" movement, therefore, helps the machinery maker's business to a certain extent. It remains only to be ascertained the extent of that benefit, and how best to co-operate with others to increase that benefit.

A close scrutiny of the Chicago show disclosed a lamentable lack of interest on the part of the cement industry. Lumber was there, and in full force. Lumber, brick, tile, flooring and roofing, plumbing and heating, practically every branch of the great construction industry, and all were busy impressing on the public the benefit of their product to the home builder. A casual and ignorant visitor to the show would have departed with the impression that the only simple, reasonably inexpensive and practical way to erect a home was by some method other than concrete construction. This is unfortunate.

A certain number of our public have but a vague impression of how concrete construction is carried on. To them it means a mystical maze of machines, forms, skilled labor and chance, and they have no definite idea whether or not it is practicable on the small or medium size job. A real need, both from the public viewpoint and from the standpoint of the industry is for education along these lines Such public exhibits as the ones now being held should be entered by the cement interests and complete exhibits should be presented impressing on the visitor the **simplicity, economy** and **long life** of concrete construction. The design of buildings and the lay out of grounds may be safely left to the other lines of industry and to the real estate man, but the plain mechanical facts of concrete construction should be impressed on every home seeker who enters the building.

No one is more competent to present such an exhibition than the maker of the machinery. He it is who designs the mechanism to perform certain functions. He understands its features and their application better than any one else, so it is he who is most capable of presenting them in an understandable way to the prospective home builder. Active co-operation should be used with the maker of cement and of concrete products to present attractive and instructive exhibits which will sell the idea of concrete. The idea can be sold, for it is sold every day to those who come seeking guidance. It must be sold to the great mass of prospective home builders who have not sufficient initiative to dig into the question of costs and facilities for themselves.

There is no question of the future of the construction industry during the next half-decade, or even longer. It will prosper. It may not prosper in all branches, for certain angles of the industry may languish while the prosperity of the others continues. It behooves each class of business man connected with this vast industry to see to it that his particular line is not overlooked. Of the twenty million American families, only a small per cent now own their homes. A great per cent of the remainder want to own them. Every year an increasing number of these attain their goal. Only those who are sold on cement and its uses will utilize concrete in the building of those homes. The world is before us.

In a big window of its office building at No. 1790 Broadway, New York City, the United States Rubber Company shows an enormous picture of an ideal section of the famous Lincoln Highway. The picture stands on an easel and is flanked by ornamental lamps and the well known "L" sign denoting the highway. The main fund for the construction of this section was contributed by the company.

The sign before the picture says in part:

"It is the contribution of the United States Rubber Company to good roads in America. Officials of the company were interested in the project through their connection as officers of the Lincoln Highway Association.

"Additional funds were provided by the Federal Government, the state of Indiana, and Lake County.

"The ideal section is a national object lesson for the study of those interested in modern road design. In every feature, paving, lighting, drainage, width, construction, roadside decoration it illustrates the trend of the best highway thought of the day."

The Anatomy of the Concrete House

By Leslie H. Allen

Assistant Manager, Concrete House Division, Portland Cement Association, Chicago.

Popular attention is being continually directed to concrete for home building. It has proved so successful in other branches of endeavor that the public wonders why more use has not been made of concrete in house construction. Its enduring qualities make it seem to be the logical material for this purpose, but although concrete is largely used for larger structures, it has not made as much headway in home building as its merits warrant. This is very often due to lack of interest by the builder or concrete men and often to the fact that many concrete houses that have been built are unsatisfactory, due to lack of care in design or construction, or due to lack of knowledge of the principles of home building.

A concrete house must be good at all points. The plan must be right, the materials must be right and the workmanship must be right throughout. If concrete block is used, it must be block of high quality and must be laid up by masons with care. If monolithic concrete is used, the form work must be accurately built and well placed. The concrete must be well mixed and spaded in the forms and care taken throughout to get a finished, workmanlike piece of work.

Any new material in use for the first time is subjected to more criticism than old materials whose merits and defects are well known and expected. If the concrete house is not right at every point, it is likely to get blamed for defects for which it is not responsible.

Of prime importance is a good foundation. If the foundation is not built right, no amount of skill or care or expense put into the rest of the house will produce a safe, permanent or comfortable home. Every building must rest upon a strong, permanent foundation. The weight of the building is carried to the soil by means of the walls. These walls are comparatively thin and would cut into a soft soil like a knife edge, and therefore, a footing of concrete is required to transmit the weight of the building from the walls to the soil.

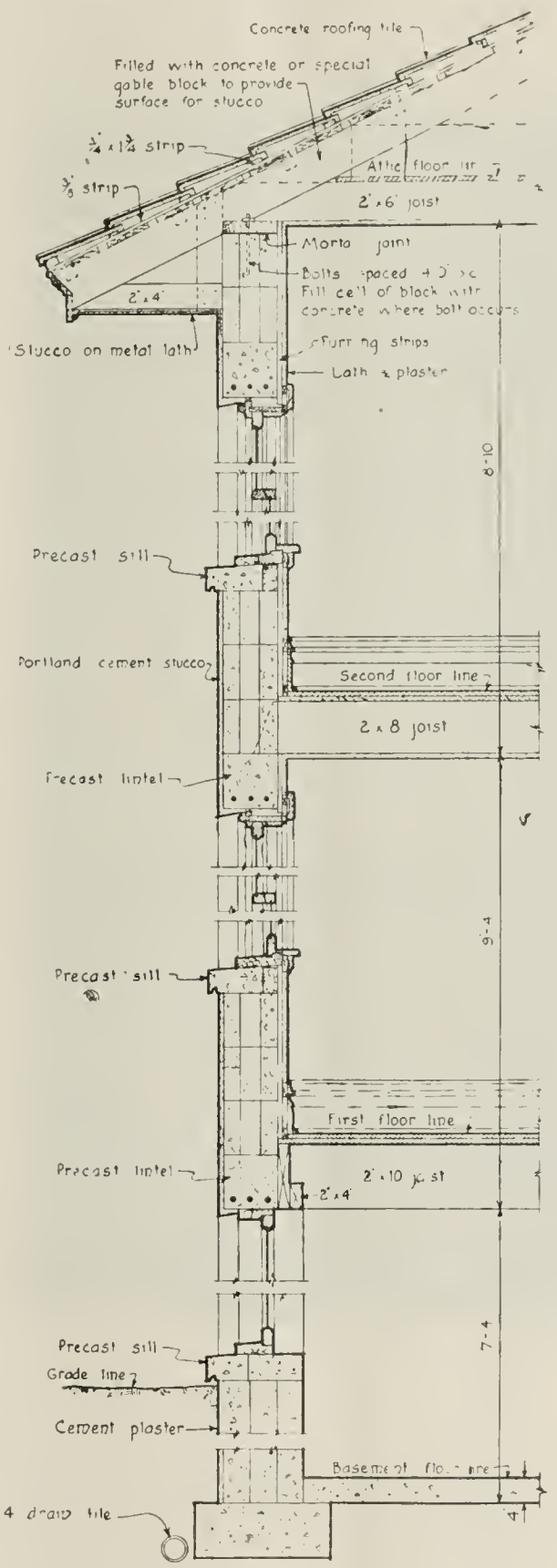
The bearing power of the soil is much less than that of the walls. Some soils are so soft that they cannot safely be loaded with more than one ton per square foot. Hard gravel and well compacted clay will carry about eight tons to a square foot, while some rock can be loaded up to one hundred tons. The width of the concrete footing should be such that the soil is not loaded with a greater weight than it could safely carry without settlement and the concrete footing is designed of a sufficient width to accomplish this. It also gives a level surface on which to start the building of the basement walls. A footing eighteen inches wide and twelve inches thick is usually sufficient for a small residence.

Cellar Walls

Concrete foundations should always be laid upon firm, dry soil. All soft soil, loam and decaying matter should be removed and the excavation carried below the lowest frost line of the district. If this precaution is not taken, frost is liable to work underneath the footing and heave and crack the walls.

There are two methods of building a concrete cellar wall. One is the monolithic method in which temporary forms of wood or steel are erected and filled with wet concrete. After the concrete has hardened the forms are removed and the outside surface is either rubbed or covered with portland cement stucco.

If proper care is taken in building the temporary form work the concrete



SECTION THRU WALL
Scale 1'-1'-0"

foundation will have even true lines, and exposed portions can be finished smooth by rubbing two or three times with a carborundum stone; at the final rubbing a thin wash of cement, sand and water is rubbed in to produce an even colored surface. If preferred, cement plastering may be applied about one-half inch thick and finished with a wood float or steel trowel.

Concrete Block for Foundation

The other method is the use of precast concrete units, such as concrete block. These block are made in a local factory and hardened in sheds or steam rooms before being sent to the site. The walls are built by masons just like a brick wall, save for the fact that the units, being larger, can be laid up far more quickly. Concrete block are generally made hollow. The air space in the block not only reduces the weight of the block but is a valuable insulating feature, causing the houses to be warmer in winter and cooler in summer than solid walls.

Well made concrete blocks are more dense, strong and impervious than any other building material except monolithic concrete and cut stone. The home builder should make sure that the concrete blocks used for his house have been made in an automatic machine tamper, and properly cured in steam tunnels or water vapor. The standard test requirements for an eight-inch by sixteen-inch concrete block is a crushing test of sixty tons; a well made block has no difficulty in passing this test.

All joints should be made in good cement mortar 1:3 well bedded and the vertical joints "buttered" both ends and pushed up hard.

Constructing a Watertight Basement

The time to make a basement wall watertight is when it is built. It costs less to build a watertight wall than to repair a leaky one later. If properly made, a concrete wall is watertight. However, it is not always easy to get first-class workmanship and when the foundation is located in heavy waterlogged soils, additional precautions may be necessary. Similar methods are used for repairing leaky basements and for insuring watertightness in basements built of concrete block or concrete structural tile.

In each case a line of concrete drain tile is placed entirely around the outside of the footing and is connected to a suitable outlet. The excavation above the tile is filled to within a foot of the grade line with gravel, cinders or some other material of a porous nature to provide a fill that will allow water to seep through quickly. When the foundation is erected so near another building that it is impossible to run a line of tile around the outside, the tile may be placed on the inside of the footing. When there is considerable water in the soil it is often advisable to place lines of tile both inside and outside of footings.

As a further precaution in securing a dry basement, two or more coats of cement plaster may be applied to the exterior surface as soon as wall forms are removed, or in the case of a concrete block wall, just as soon as the mortar joints have hardened. The wall surface should be first thoroughly dampened. A similar coat of cement plaster may be placed on the inside surface if desired.

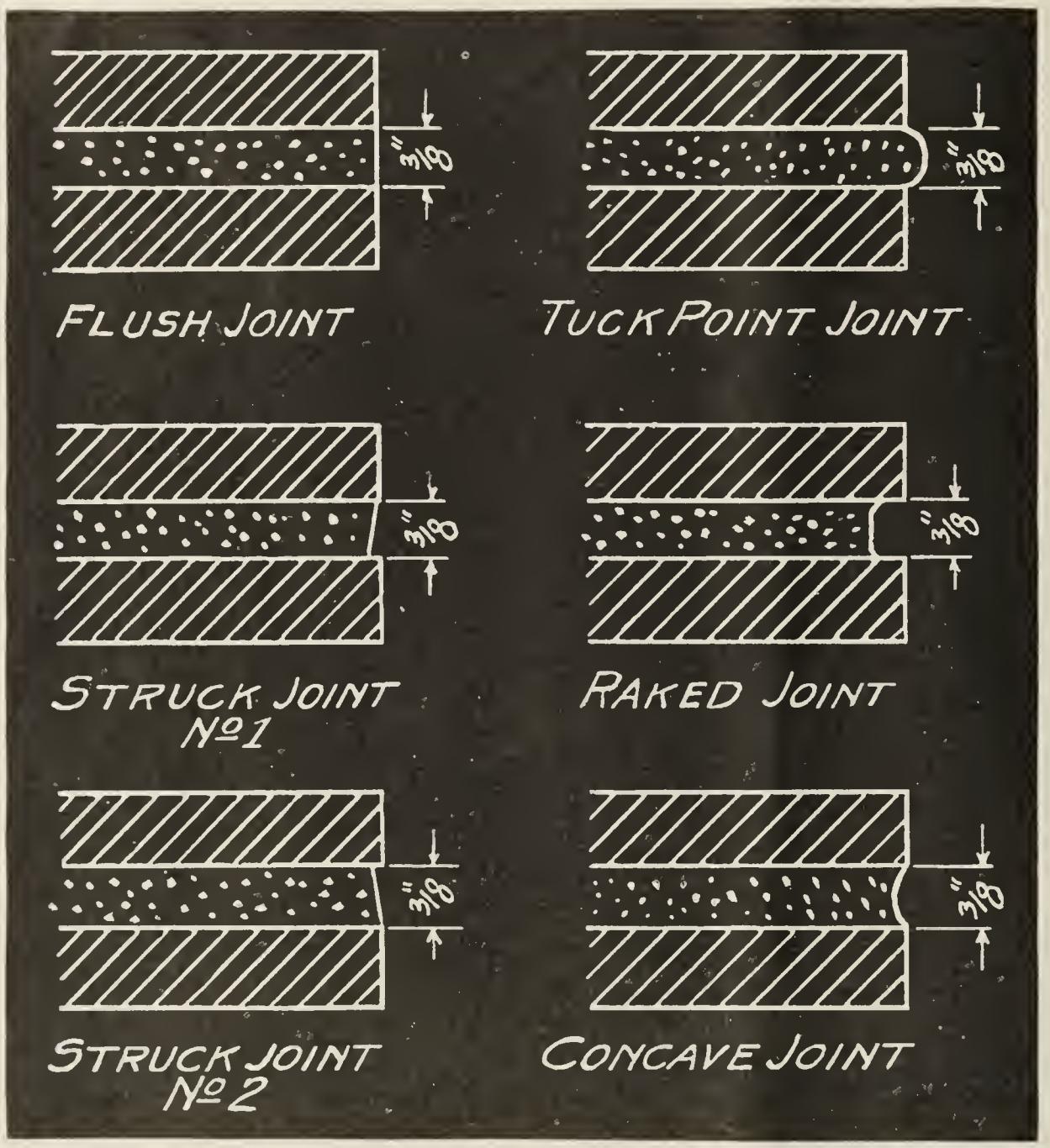
Another common method of wall treatment is to coat the exterior surface with hot tar, pitch or some other suitable asphaltic preparation using a broom or fibre brush. The wall must be clean and dry when this coating is applied, otherwise it will not adhere. The plaster

treatment is the most satisfactory method. Some builders use both.

The footings of the internal basement columns or walls must be sufficiently strong to carry the load of the interior of the house. It is often the case, in spite of good wall construction on the exterior, that the whole interior of the house is allowed to rest on two or three iron columns, like toothpicks, resting on the thin paving or insufficient footings below, and the result is that these columns settle and cause settlements and cracks and consequent depreciation all through the interior of the house.

Partitions in Cellars

Basement partitions of four-inch concrete block or tile are recommended as



far superior to the old method of carrying the interior of the house on two or three beams and columns and placing match board partitions. If the foundation walls are built of monolithic concrete, basement partitions may be placed in the same manner at the same time. This rigid support given to the floors insures that there will be no settlement of the interior with consequent cracking of plaster and loosening of the interior trim. Such partitions afford fireproof enclosures for heating equipment and fuel, keep steam and moisture within the laundry and provide more rigid support for the first floor. Coal dust and boiler ashes are confined and the fire risk is greatly minimized.

How to Build the Upper Walls

When the basement walls of concrete block or monolithic concrete have been completed, it seems logical to carry the same type of construction up to the roof line. There is no good reason for stopping this construction at the first floor line and turning to inflammable material when permanent construction of concrete can be had for the same or a very slight increase in cost. This increase seldom exceeds from three to five per cent of the cost of the house and in some localities actually costs less. The outside covered with stucco, is waterproof and the inside is furred and plastered, making the house absolutely dry and warm.

Face Block

Where faced block are used one of the joints shown in the illustration, should be used—the struck joint or weathered joint No. 2 is the customary one. No. 1 is bad as rain water will lodge on it and eventually penetrate the wall. The tuck joint is seldom used but is quite effective. It is made of lime or white cement and applied after wall is finished.

Note that in jointing face block the color of the joints should always be a little lighter in color than the block to get the most pleasing effect. A light colored block with block joints is never satisfactory.

A house built of concrete block should fit together without a lot of expensive cutting and patching. Enough half blocks should be furnished to make a bond and special jamb blocks for window openings made to fit in with the adjoining walls.

Lintels

Walls must be properly bonded and lintels to carry walls over doors and windows must be specially made for the purpose. In some localities it is the custom to use a wooden lintel in a concrete block wall. This is not a good practice as there is a possibility of shrinkage in the wood lintel that would cause cracks to appear.

Hollow Walls

In hollow walls with continuous air space which are plastered direct without furring inside this air space must be continued through the lintels. Concrete lintels made in two pieces carrying inside and outside walls are recommended.

It is important that the hollow air space be sealed tightly to prevent movement of air as insulation is much impaired if air currents pass through the hollows. Window and door frames must be well bedded in mortar and crushed in and the top of the wall covered with a wood plate bedded in mortar.

Chimneys

Chimneys can be constructed of concrete block. The usual method is to use specially made four-inch block around tile flue linings, in order to reduce the amount of waste space caused by the use of eight-inch standard block for this purpose. Special chimney block such as the Multiplex, are also used. Thousands of Multiplex block are being used in frame houses also, where they stand erect without any tying to the frame work. This block does not make any provision for bonding to adjoining walls.

Fireplaces are often built of concrete block, or specially made concrete trim. The designs of concrete houses published by the Portland Cement Association each contain a different fireplace design of concrete.

The hearth to the fireplace should be a concrete slab. This is more quickly and economically installed than the old time brick arch.

Cellar Floors

The many obvious advantages of concrete cellar floors make them the unquestioned choice in all good houses. A good concrete floor must be at least four inches thick. In some cheaply built houses, the builder contents himself with covering the floor with a layer of gravel or crushed stone, and laying over this cement mortar about one and one-half inches thick: This does not make a satisfactory floor. A cellar floor should be finished with a steel trowel as smoothly as possible so that it will not hold dust and can be easily swept. A concrete floor is jointless and impervious. Rats cannot burrow through it and water will not come through.

Furnace Room Ceilings

For fire protection it is advisable also to put concrete ceiling over the furnace room or if the expense of this seems prohibitive, ceilings of metal lath covered with portland cement plaster can be used. Recent tests have shown that ceilings so protected will resist a fire of more than average intensity for over one hour, thus adding very greatly to the fire protection of the house as in these rooms fires are most likely to start. If concrete floors are used, metal lath is of course dispensed with.

Floors

Porch Floors: Exterior steps and porches suffer the most severe exposure and usually are the first to show wear and decay. If built of concrete they will

last as long as the rest of the house without the necessity for continual painting and repairs to keep them in shape. Concrete porch floors are always clean. They can be washed down quickly and easily, and do not harbor dirt.

Bathroom Floors: The floor of the bathroom will also be of concrete to receive the tiling. This may be constructed by nailing boards in between the floor joists and filling up with concrete to a thickness of three inches or more, making a firm level bed to receive the tile. It is well to embed expanded metal lath in this concrete to prevent cracking Tile cannot be stuck down to a wooden floor: a concrete bed to which cement mortar will adhere is necessary in order to get a good job of tile setting.

Living Room Floors: Some home owners have gone still further and have built all their floors of concrete. There is a widespread idea that a concrete floor is cold, but this is not strictly true. A concrete floor is a good conductor of heat and cold and a concrete floor laid on the ground or placed over a cellar or unexcavated space which cannot be heated, will conduct cold upwards and always feel cold to the touch, but a concrete floor over a warm basement will hold the heat just as stones from a fireplace cooker do and actually feels warmer to the touch than a wooden floor. All the newer first-class hotels in our big cities have concrete floors, overlaid with carpets or rugs; no discomfort to hotel customers results.

Even though it may be many years before the existing prejudice against concrete floors for residences is overcome, their use is continually growing. A concrete floor for a living room bordered with tile and furnished with a few good rugs costs no more than a first-class hardwood floor. It is easier to keep in good condition and gives a pleasing and palatial effect. Some builders cover concrete floors with a good grade of linoleum. An enamel painted border is another excellent way to finish the floor

A reinforced floor should be laid on well braced wood form work. It is usual to use a slab three or four inches thick, the load of which is transmitted to reinforced concrete beams which carry the load to the walls. A simpler construction requiring less form work is to use a thicker slab heavily reinforced without beams—but the cost will be found to be somewhat higher. The ends of beams should have a bearing of four to six inches on walls or piers at each end but neither beam nor slab should extend through the full thickness of the wall.

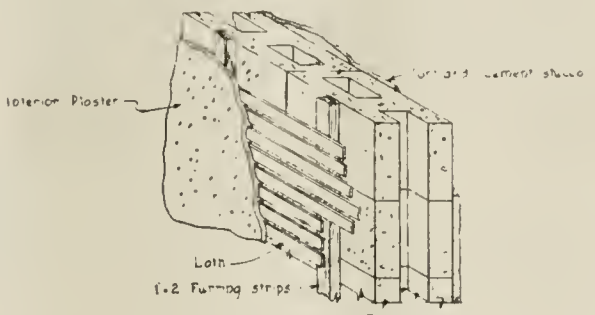
Finish Flooring: If wood top surface is required on a concrete floor two inches by three inches, sleepers should be laid on the floor levelled up and spiked to the concrete while it is green. If laid twelve inches apart the top flooring may be nailed direct to them without the use of under flooring, but if wide spacing is adopted the customary rough under floor should be used.

Wood Floor Construction: If a wood floor is used in a concrete block building the joists on the upper floor should be built into recesses in the block wall. The best way to form the recesses to use special "joint block" in which the recess is formed at the end of the block. Some contractors prefer to use a split block—the front of the wall having a four-inch block sixteen inches long and the back having a four-inch block fourteen inches long fitted between the wood joists. Underwriters call for a "fire cut" on the end of the joist so that in case of fire causing the collapse of a wood floor the joists can fall out of the wall without endangering its stability. Wood joists should have a bearing of at least four inches at each end and should rest on a smooth true masonry surface. The common practice of shimming up with small wedges is poor construction that invariably causes slight settlements in the floors and consequent cracking.

Insulation

Good concrete of itself is not damp, porous or absorbent, but condensation, similar to that which is observed on the outside of a pitcher of ice water on a hot day, will be found on a concrete wall that is not insulated, on a day when there is a sudden fall of temperature. This is particularly true if there is much humidity in the atmosphere.

In the northern part of the United States where there is a long period of cold weather, proper insulation is necessary for any form of masonry construction. This is particularly true of concrete, which, being a very dense non-absorbent material, is naturally a good conductor of heat and cold. Furring and lathing is the method usually employed to keep the plastering away from the concrete wall and form an air space or insulting chamber; this maintains the temperature of the inside of the wall at room heat and prevents the condensation of moisture which would otherwise form, giving rise to the impression that concrete is damp. Some builders prefer to use sheets of insulating material such as cork, or quilts of vegetable fibre to which plastering is applied instead of the lathing. Wood furring and lathing is shown in the illustration. The furring strips are nailed to wood plugs driven in the mortar joints of the block.



FURRING DETAIL

Finishes

How to Finish the Walls: Concrete block can be surfaced to resemble limestone or granite or can be left with a rough face on which portland cement stucco is applied. The popular demand for artistic stucco surfaces is well supplied by the latter method as the concrete block and portland cement stucco, being made of similar materials, will adhere perfectly and avoid the possibility of cracking which sometimes disfigures stucco on frame construction.

There is no better finish for a concrete wall than portland cement stucco, it is hard, waterproof, permanent and attractive in appearance. It will adhere more perfectly to concrete than to any other material because of the similarity of its component elements, and if carefully applied will give a beautiful and absolutely permanent surface that requires no painting. maintenance or repair.

Stucco Colors: It can be finished in a variety of colors; a perfect white can be obtained by the use of white sand and white cement in the finish coat—or by the use of colored stone chips rough cast.

Stucco Surfaces: Some architects and owners prefer an even surface obtained with a wood float or a stipple brush, but the most popular finish is the rough cast, in which clean chips of white quartz, red and pink granites, micaspar, green marble and other stones are dashed onto the final coat before it begins to harden.

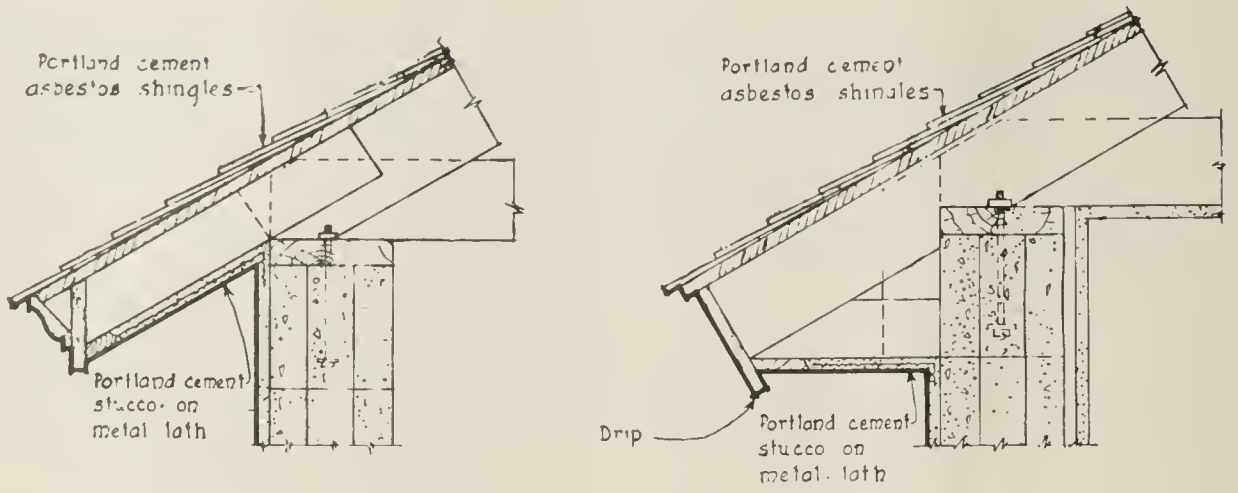
Stucco work will always give good results if put on right but it is so often badly handled by inexperienced men that a word of caution should be given that only experienced plastering contractors, who can show good work already done should be engaged to apply it—the following suggestions have been drawn up to emphasize the danger of using incorrect methods.

1. Don't trust important work to inexperienced workmen.
2. Don't use dirty sand or sand that is not properly graded. Not more than five per cent should pass a one hundred mesh screen.
3. Don't neglect to mix sand and cement thoroughly for two minutes before water is added and three minutes more after water is added. If possible use a machine mixer.
4. Don't mix larger batches than can be applied in thirty minutes.
5. Don't retemper mortar. Throw away any mortar that has begun to harden before using and mix a fresh batch.
6. Don't neglect to measure proportions accurately and don't change them. Use the same proportion for all batches of one coat. One sack of cement to three cubic feet of sand is best. Richer mixture may craze. Lean mixtures will be porous.
7. Don't use more water than is absolutely necessary to produce a plastic mortar that works easily.
8. Don't add more than ten pounds of hydrated lime to each sack of cement you use.
9. Don't apply stucco to dry block walls. Drench the block with water before stuccoing.
10. Don't trowel stucco surfaces smooth. Use a wood float but not a steel trowel.
11. Don't work stucco coats more than is absolutely necessary. Keep mortar coats wet for several days. Apply water as soon as each coat has set up enough so that it will not wash. Apply the stucco continually—don't let it dry at the edges—Run the second coat the day after the first coat. Roughen the first coat to give better bond.
12. Don't apply finish coat until previous coats have been cured for at least one week.
13. Don't run stucco to grade line. Use six or eight inch belt course at grade line and run stucco to belt course.
14. Don't omit overhang with steep wash and drip on all belt courses, watertables, sills and other projections, etc.
15. Don't put stucco on horizontal surfaces where water can collect.

Stucco Details: In applying stucco to the outside walls, care should be taken that the stucco is stopped sufficiently high above the finished grade of the ground outside to be clear of splashing during rainstorms. At this point a joint or drip should be formed in the part below and covered with portland cement plaster, trowelled off smooth or faced with facing block.

All window sills, arches and other partitions should be constructed with a drip in order that water may not flow under them carrying dirt and dust into the stucco surface below.

A well made stucco wall is waterproof and may be washed down with a hose. If the wall is dull and unattractive, it


Portland cement asbestos shingles
Portland cement stucco on metal lath
Drip
Portland cement asbestos shingles
Portland cement stucco on metal lath

EAVE DETAILS

Scale 1½=1'-0"

may be freshened up by applying one of the specially prepared cement paints, put out by various firms.

The Roof

Eaves: Care should be taken that no points are left open to the attack of fire. Eaves are often the entering point of flame from conflagrations. They should be lined with metal lath and plastered with portland cement stucco, as shown in the illustrations.

How to Cover the Roof: There is no excuse for continuing to use inflammable roof coverings when fire resisting roof coverings of concrete and other materials are now available at a very slightly increased cost. Concrete roofing tile are being extensively used in a few cities and it is probable that in a very short time they will be available for home builders in every part of the country. Concrete roofing tile can be made in a variety of pleasing colors and laid to produce an absolutely watertight and fire resisting roof. Its weight does not exceed that of a slate roof.

Boarding and felt is recommended under concrete roofing tile though not absolutely essential, the concrete tile (not having been burned in a kiln) does not warp and lies absolutely snug and tight on its neighbor. The best practice is to lay vertical furring strips down the roof slope on the boarding and belt and over these to place the battens that hold the tile. Concrete tile are usually made with nails that catch on the battens and require no nailing. Pointing also is unnecessary except at hips and ridges.

Owing to the even, true shape of concrete tile they can be laid with much less lap than other tile—and as a result the weight of slate. Heavier roof framing is therefore not needed.

Steps and Walks

The first part of the house to show signs of wear and decay is the wooden exterior steps. Subjected to constant wear and exposure they should always be built of permanent enduring materials.

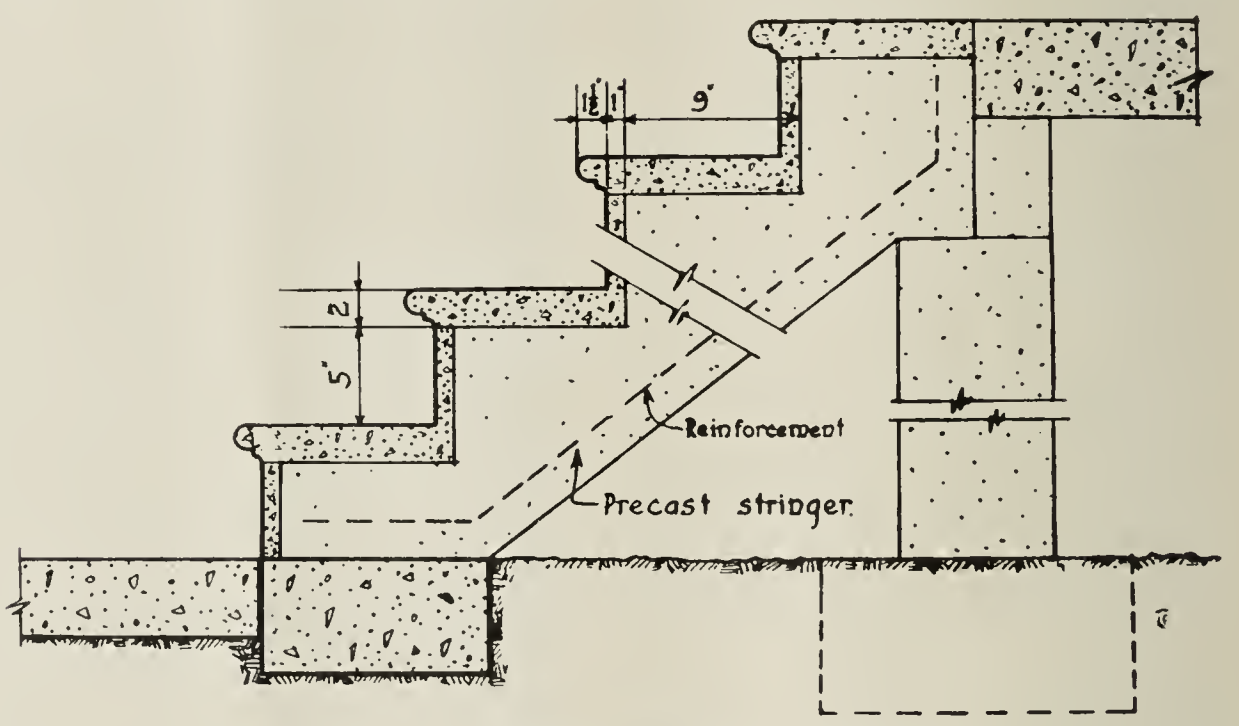
Concrete steps will not wear out. They are easy to clean, never require painting, do not sag or splinter and give a substantial well finished appearance to the home. They are smooth enough for safety but not slippery, and free from joints and irregularities that make the brick step unsafe.

Cellar steps are usually cast in place between wood forms as shown in illustration.

Steps above grade can be monolithic or precast as shown in the illustration.

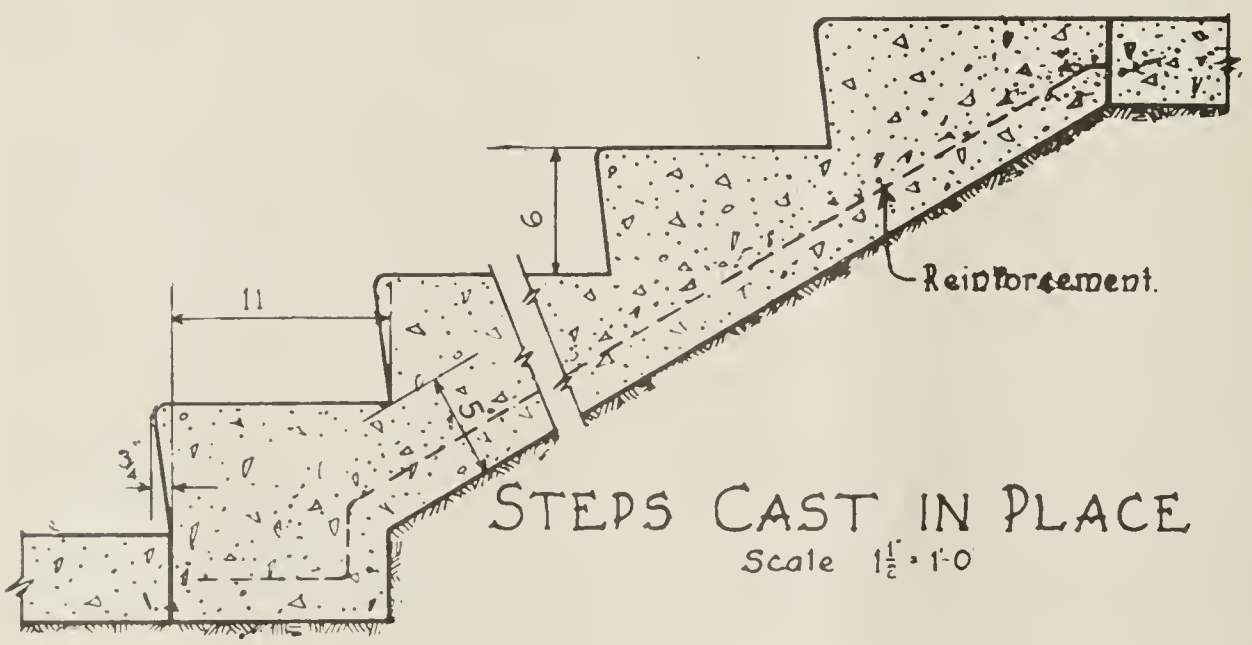
Concrete also is the most popular material for paths, walks and driveways about the house and grounds.

Method of Laying Walks: Concrete paths should be not less than four inches thick—the best practice is to lay them in one operation instead of in two courses, which used to be a common practice. They should be finished with a wood float—giving a slightly rough appearance which gives better traction and is more resistant to wear than concrete finished with a steel float. A subbase of coarse gravel, cinders, broken brick, etc., is advised especially if ground is soft and spongy. And a delightful informal effect in the garden can be obtained by concrete slabs laid as stepping stones two and one-half and three inches thick of varying sizes from twelve inches square up to twenty-four inches square. Garage driveways are always of concrete nothing else gives equal satisfaction.



PRECAST STEPS

Scale 1½"-1'0"



STEPS CAST IN PLACE

Scale 1½"-1'0"

House Plan

Advantage of a Good Plan: The most important part of building a house is very often accomplished before actual construction begins. The economy, comfort, convenience and appearance of a house, are largely dependent upon the care and thought employed in devising the plan. A well-planned house is a joy to those who live in it, while one that is badly planned costs as much or more to build and is a continual source of dissatisfaction and annoyance.

The home is the housewife's laboratory and workshop, therefore, it is imperative that careful consideration be given to those elements of the plan which simplify and lighten household operations.

Expert Planning Needed: The ability to plan efficiently and well is not possessed by everyone. It is acquired mainly by training and experience. But the increasing interest in domestic science and the capability of the American woman as a housewife are bringing to the fore the value of efficiency in plan and

(Continued on page 38)

Manufacturing Concrete Products*

By W. H. Carey

Under this head, I desire to place before this meeting for its consideration, one fact of tremendous importance to this concrete products industry, which has been brought forth and given publicity through the combined efforts of the Portland Cement Association in cooperation with the Lewis Institute of Chicago and Prof. Duff A. Abrams in charge of its laboratory as well as of many thousands of tests necessary to the establishment of this fact.

The result of this wonderful research work has brought to light and proved one mighty fact, among other lesser ones, which is this; That of all the ingredients necessary to the make up of a concrete mix which will produce the highest possible quality of concrete, the most important factor is the ratio of water content of the mix or the relative consistency of the mix. What is called the "Normal Consistency Mix" gives or produces the very highest possible quality of concrete.

Departure from this "Normal Consistency" in either direction, the use of either more or less water in the mix, (even a very small amount,) causes a rapid falling off in quality of the resultant concrete, a much more rapid reduction by using less water than required, but a sure, even though slower loss by the use of too much water.

The Proper Amount of Water

The use of about fifty-eight per cent of the proper amount of water will give a concrete of only about sixty per cent value, while the use of about one hundred thirty per cent gives about the same, sixty per cent result. This shows that if you use about fifteen per cent less than the proper amount of water ,it causes about the same loss as does the use of thirty per cent too much water, which makes the loss approximately twice as rapid on the dry side over that produced on the wet side, by a given departure from the correct amount of water.

Now, this recent discovery touches the concrete products industry in a very delicate, if not vital spot, in the matter of the possibility of making products, more especially, hollow products, of the highest possible quality, using this "Normal Consistency Mix."

Is there a machine or system of molds on the market which will or can economically use this "Normal Consistency Mix" in the making of hollow building units?

Please bear in mind that this "Normal Consistency Mix" is plastic and cannot be removed at once from the molds in which it is formed, (because it would slump out of shape if so removed) but must of necessity be left in the molds until hardened, at least sufficiently for safe handling.

This fact, it seems to me, eliminates all machines which discharge their product from the molds at once. No matter how beautifully they may be built, nor with what clock-like precision they may operate, they never can handle this plastic mix; at least so long as they remain machines which discharge their product from the molds at once, or prior to the hardening of the block.

*From a speech made at Wisconsin Concrete Products Manufacturers Association, Milwaukee, Wis., February 20th and 21st, 1923.

Machines and Molds Discussed

Now, let us see how we fare when we consider all of the mold systems on the market at present, on the wet side of the question. I do not believe there is a poured system of molds on the market which can, economically use a mix so stiff as the "Normal Consistency Mix," particularly in making hollow products.

If there is such a system, I am not aware of the fact. I know it cannot be used in the system we have, the Zagelmeyer, which I cansider the most practical of any I know of. The reason the "Normal Consistency Mix" cannot be used in the Zaglemeyer block molds, is because it is too stiff to be worked under the cores, the two parts of the mix would not weld together under the cores.

If I am correct in this, then, there is no machine or system of molds on the market with which we can make this greatly to be desired highest possible quality of concrete products, using a "Normal Consistency Mix," which is the only mix which will, or can produce such quality concrete.

Therefore, we will have to be content to fall considerably short of attaining to this ideal quality product, until such time as a process and machine is forthcoming which will enable us to economically produce hollow concrete products of this highest possible quality.

A Chance for Inventors

In the meantime, while we are awaiting the coming of this new process and machine, which is as sure to come as is the sun to rise, let us, each and every one of us, strive with all our might and with every available means, as well as by every possible method, to produce the very best quality obtainable from the machines and mold system we now have, or may buy in the future.

If you have a machine operating on the dry side, try using a little more water in the mix, keep on adding water to your mix until you reach the slump point, at which, or just short of which, of course, you have to stop. If you will do this, you will find a very large improvement in quality of your product.

If you are using any of the poured mold systems, then use less water in your mix. Keep cutting down on the into place in the molds, cut down to the very limit, use just enough water to make it possible to place the mix in the molds right, and no more, even though this requires more work to fill the molds with this kind of mix, then you will find a water content and increasing the amount of elbow grease used in working the mix most satisfactory improvement in quality of your product. By following out the above suggestions faithfully, we will all turn out at least a fair qaulity product, one which will pass all tests required, which will be a distinct and positive improvement over that which some plants in the state have been producing in the past.

This is still a very young industry. As yet we have scratched only the surface of things pertaining to it. It has gone through some very hard knocks, it has withstood some shameful abuse at the hands of those unscrupulous and ignorant assassins who tried to make money out of the business without putting into the business any of the worthwhile things which are so necessary to the fostering and building up of a new industry. Many of the men who took a fling at this business in the past. (They are nearly all out of it now, thank the Lord) brought to it nothing of value, not common honesty, intelligence, capital or judgment, nothing but the inordinate ambition to get rich quick by fooling the public, but they finally found themselves worst fooled of all. Their room is far better than their company. Good riddance to their ilk.

We are now entering a new era in this industry, with the new discoveries of scientific research placing us upon a more secure and better respected as well as more trusted footing with the general public, a much brighter vista looming up and opening before us than we ever had before.

I can see nothing but the very brightest of prospects ahead of us, with an ever broadening field, a readier, easier and more profitable market for concrete products.

If we will but do our share, which means briefly, treating our public and our customers honestly, fairly and courteously, making and selling a product which will successfully stand all necessary tests and above all, give thorough satisfaction to the user, then we cannot and will not fail to meet with abundant and well deserved success in the very near future, which I wish to all of you from the bottom of my heart.

U. S. Good Roads Show

An event of interest to cement men and contractors will be the U. S. Good Roads Show, to be held in the Textile Hall, Greenville, South Carolina, April 16th to 21st inclusive.

The Fez dormitory basement walls at Moosehart, Ill., the famous settlement founded and maintained by the Loyal Order of Moose. The reinforcing is in position for second floor stairway. This is a part of the construction now going on at Moosehart in which concrete in it various applications is a dominating factor.

Portland Cement Stucco and the Surface Finish of Concrete Block*

By Franc J. Gardner

Western Service Manager, Atlas Portland Cement Company, Chicago

The charm of stucco has been known before the days of ancient Greece and Rome. By those peoples it was used extensively and through them spread to other lands. The Persians and the Moors realized its beauty and in truth there is hardly a country where for centuries it has not been a favored type of building construction.

As civilization spread, the use of stucco followed and it has been and now is used throughout the civilized world. From the coldest countries to the tropics, it will be seen everywhere because stucco has those essential properties that are so desired, namely, beauty and durability. Since it is applied in a plastic state it can be fashioned and treated in endless ways. Colors and textures are limited only by the ingenuity of the plasterer and the architect. It can be made smooth or rough, white, or tinted in many colors either by the use of mineral pigments or by using colored sand and the coarser colored aggregates. It is adaptable to practically every type of architecture and is capable of combination with most types of building materials in very effective ways. Because of these facts it can be made to lend a distinctively homelike and livable appearance to a house especially since it never needs painting and therefore will, from an artistic point of view, mellow with time and become an integral part of the landscape. Age improves its looks, but it does not cause it to decay.

As seen throughout Europe, the stucco of early days, which has been so admired in conjunction with its use in beautiful French and Italian villas, was made largely of lime. It served quite well for the mild climate of those countries. It was also used by the early settlers in Pennsylvania and in New York, but it was slowly attacked by the action of cold and frost. Much of this stucco has lasted well over a century but only in exceptional cases. I have in mind one particular instance that was brought to my attention some time ago. The house was a stone one which had been stuccoed with lime, and in order to keep up the appearance of the house and to hide the cracks which appeared, the owners had whitewashed it very often. As you know, whitewash is largely lime and it was found upon examination that this whitewash had added so much thickness to the original stucco coat that in some places the woodwork of the windows was partially obscured.

The introduction of portland cement, eliminated many difficulties which had been previously experienced. As you all know, anything made with portland cement, when it is made properly, gains strength over a considerable period of time. When correctly applied portland cement stucco is as true a type of permanent construction as can be found.

Stucco is a mixture of portland cement sand and water with sometimes hydrated lime or other materials which are not absolutely necessary, but which aid materially in increasing the plasticity of the mix and therefore the ease with which it can be applied. It is applied while still soft and in several layers, usually three in number. These layers or coats bond to each other perfectly and form a uniform and homogeneous coat of stucco which should be at least one inch thick. Portland cement stucco can be applied to any type of wall construction with entire confidence. The backing, of course, has a great deal to do with the permanency of the whole structure and it is easy to realize that the best kind of backing is a masonry wall.

The Best Kind of Backing

A masonry wall of monolithic concrete is ordinarily judged the best. Second to this comes a concrete block wall. It is easy to see why portland cement stucco on concrete made with portland cement as the binding medium is the best. When the stucco is applied the wall and the coat of stucco form what is practically a single mass. In using a stucco made of portland cement over concrete block, you are getting a coating for that wall which is as permanent as the block themselves.

I could go on here and describe to you the various methods and reasons for using stucco over all types of building construction but I take it that you gentlemen are interested solely at the present time in stucco over concrete block or concrete building tile. If there are any questions that you would like to ask at the end of my talk in regard to stucco over these other types of building construction, I shall be very glad to answer them. The modern tendency, too, is for more permanent construction. The rise in the price of lumber has brought us to a point where a house built of concrete block, which are just beginning to come into their own, is nearly as economical in many localities as the wood frame construction. It is true that in most places the cost of a concrete block is slightly higher than frame construction but the advantages in the permanence of concrete block together with its great resistance to fire, should easily be sufficient reason for building of concrete block instead of wood.

As used with concrete block, stucco is mainly for architectural effect. To build a wall of concrete block with an exterior surface that is pleasing in effect is expensive, not especially from the standpoint of obtaining a finish on the block that is pleasing, but because of the greater care that must be taken by the stone mason when laying the block in a wall. When stucco is to be used, very little care need be taken in striking the joints, in preventing the mortar to drop, and it is not necessary to line the blocks up so exactly because the three coats of stucco will smooth out all inequalities that may be present.

Stone walls are only possible in certain portions of the country where rock suitable for building use can be obtained. From the standpoint of lasting qualities it is unexcelled but it can rarely be used without great expense. It is a material that blends very well with stucco. While monolithic concrete forms perhaps, the most perfect material for wall construction upon which to apply stucco, and its use for house wall construction is increasing steadily, it is as a rule more expensive than concrete block and since its use is more cumbersome due to the forms, etc. that are required, it is not gaining very rapidly.

Concrete block for stucco wall construction should be rough and of coarse

A Baltimore residence built of concrete block and stucco

*Speech made at Wisconsin Concrete Products Manufacturers Convention, Milwaukee, Wis., February 20th and 21st.

A colonial design from New England in which concrete block and stucco are used

texture but not weak and friable. The blocks should be set with cement mortar joints which should be raked out or cut back even with the surface. Before applying the stucco all dust and dirt should be brushed free from the surface and the surface should be wetted down to such a degree that water will not be rapidly absorbed from the plaster, but it should not be wetted down so that the plaster will slip or sag when it is applied.

The ingredients for stucco are cement, sand, water and sometimes hydrated lime as mentioned before. The proper kind of sand can usually be easily obtained in most localities. In Wisconsin you have in most cases very good sand locally and if it is not obtainable locally there are very good grades of sand available in several places. Hair or fibre is sometimes used in stucco but for stucco on concrete block it is not necessary. It is generally only used where stucco is applied over expanded metal lath. The fine aggregate should consist of sand or screenings from crushed stone or crushed pebbles, graded from fine to coarse, passing, when dry, a No. 8 screen. It should be preferably of silicious materials and should be clean, coarse, and free from loam, vegetable, or other deleterious matter. It is hardly necessary to go into detail on this subject since you all undoubtedly know how important it is to use the proper aggregate. The hydrated lime that is used should meet the standard specifications for hydrated lime of the American Society for Testing Materials.

Coloring Pigments

The matter of coloring pigments is one that is attracting more and more attention at the present time. While mineral pigments often give very good results, those good results are only obtained because the pigments themselves are carefully chosen for the particular work for which they are intended. The ordinary mortar colors designed for use with lime mortar are not generally satisfactory and for this reason most manufacturers of mortar colors have pure mineral pigments, specially made for use with portland cement.

Machine Mixing the Best

The importance of proper and thorough mixing of the ingredients of the mortar cannot be too strongly emphasized. Machine mixing is in all cases to be recommended in preference to hand mixing. When hair or fibre is used the method of mixing it with the mortar should be such as to insure good distribution and entire freedom from clots. The ingredients should preferably be mixed until thoroughly distributed and the mix uniform in color and entirely homogeneous. The quantity of water necessary for the desired consistency should be determined by trial and thereafter measured in proper proportion. Many plasterers do not consider this necessary since they feel that they can tell by the way the mortar mixes whether it has the proper amount of water in it or not From your experience, however, you know that in many cases the color of your block can be varied slightly by using various proportions of water. The more water you use the lighter the color is likely to be. This is very easily demonstrated and many of you are undoubtedly familiar with the fact that blocks made by the wet process are many times uniformly lighter in color than those made by the dry. Where white portland cement is used for the finish coat this does not apply but if for any reason gray is to be used, it is advisable to remember this point.

In machine mixing a suitable mortar mixing machine can be used. In order to get a perfectly homogeneous mixture, it is recommended that the machine mixing should be carried on for not less than five minutes after all ingredients are introduced into the mixture. When the mixing is done by hand, a watertight mortar box should be used and the ingredients mixed dry until the mass is uniform in color and homogeneous. The proper amount of water is added as before and the mixing is continued until the mortar has a uniform consistency.

The Number of Coats

The question as to the number and thickness of coats of stucco mortar can best be answered by assuming that every coat of stucco has its own particular function. The scratch coat is first applied and its purpose is to furnish an intimate bond and a secure support for the main body of the stucco.

The function of the second coat, which is called the brown or straightening coat, is to establish a true and even surface upon which to apply the finish. It forms the body of the stucco and fills the hollow of the scratch coat. For this reason an average thickness of three-eighth inch to one-half inch will usually be required. The brown and finish coats, or the scratch and brown coats, are sometimes combined in two-coat work, which is permissible when the base upon which the stucco is applied is fairly true and even, or when, on account of cost consideration, the best obtainable finish is not required. It is difficult, however, to obtain a satisfactory finish on a coat which runs half inch or more in thickness since the tendency of a heavy coat to bag and slip is likely to produce an uneven surface.

The main function of the finish coat is its decorative value, although since it bonds with the second coat it performs certain structural functions. Since its function is, however, almost solely to provide an attractive appearance, it should be borne in mind that any mixture or any method of application that may detract from its appearance or in any way injure its permanency should be avoided. Herein lies the reason for lean mixtures, which are more likely to be free from unsightly defects than rich mixtures. Lean mixtures are also more likely to improve in appearance under the action of the weather. The finish coat should be as thick as possible consistent with covering capacity and may vary from one-eighth inch to three-eighth inch in thickness, depending upon the type employed. It is very seldom, however, that it is desirable to have the finish coat less than a quarter inch in thickness.

It is obvious then that first-class stucco should be three-coat work no matter what kind of a backing is used. The bond between the first or brown coat and the second or scratch coat needs to be strong in order to carry the weight of the body of the stucco and for this reason it is considered preferable to apply the scratch coat the day following the application of the first coat. Except in dry or windy weather, little wetting of the scratch coat should be necessary

A California mission bungalow made with ivory stucco

A popular type in the suburbs of Chicago

when the brown coat is to follow within twenty-four hours. A slight degree of absorption in the scratch coat is probably better than to have complete saturation with water, because the brown coat as well as the others, is necessarily mixed with a larger quantity of water than it requires for maximum strength. The removal of a portion of this excess water by the suction of the undercoat not only improves the quality of the coat but also insures a better bond by tending to draw the fine particles of the cement into the pores and interstices of the undercoat.

Whereas the interval between the application of the brown coat and the scratch coat has already been recommended above as being relatively short, the interval before applying the finish coat should be as long as permissible under the conditions of the work. The reason for thus delaying the application of the finish is to enable the body of the stucco to obtain its initial shrinkage and a nearer approach to its final condition of strength and hardness, before being covered with the surface coat. The bond of the latter needs to be intimate rather than of maximum strength and if the body of the stucco has been allowed to set thoroughly and harden, it may be assumed that there is less liability of volume changes in the undercoats to disturb the finish coat. A week or more should elapse between the application of the brown and finish coats, although in many instances where this procedure was not followed, excellent results have ensued. It is only an added precaution which may be taken to insure as nearly perfect results as are possible to obtain.

The finish should be applied over a damp but not saturated undercoat because excess water is liable to prevent the formation of a good bond. Certain types of finish such as the wet mixtures used for sand spraying, or for the "spatter dash" finish, may preferably be applied to a fairly dry undercoat, since suction must be depended upon to prevent streakiness and muddy appearance, and "flat spots." The fact that finish of this type applied in this manner may set and dry out with little strength is not serious. They gradually attain sufficient hardness with exposure to the weather and the undercoats provide sufficient structural strength to prevent cracking.

Curing the Coats of Stucco

Curing of the undercoats by sprinkling and protection of the finish coat against the sun, wind and rain and frost by means of tarpaulins are always to be recommended. This is not always feasible, and therefore specifications should insist only upon reasonable precautions. The application of cement stucco in freezing weather should be avoided, and, in fact, temperatures slightly above the freezing point may allow frost to form on a damp wall. The application of stucco under such conditions is likely to result in failure. Curing of portland cement stucco is just as important as is the curing of any concrete products. The best and most feasible method is usually to spray the wall surface with water from a hose morning and night. The walls should not be just sprinkled but should be given a good soaking.

All coats should contain not less than three cubic feet of fine aggregate to one sack of portland cement. If hydrated lime is used it should not be in excess of one-fifth of the volume of the cement. A larger portion than this will cause a decrease in strength of the mortar. This means that with every bag of cement there will be one-fifth of a cubic foot of lime which amounts to approximately eight to ten pounds. Hair or fibre need not be used over concrete blocks. As I mentioned before, it is only necessary to use this where metal lath is used over frame work.

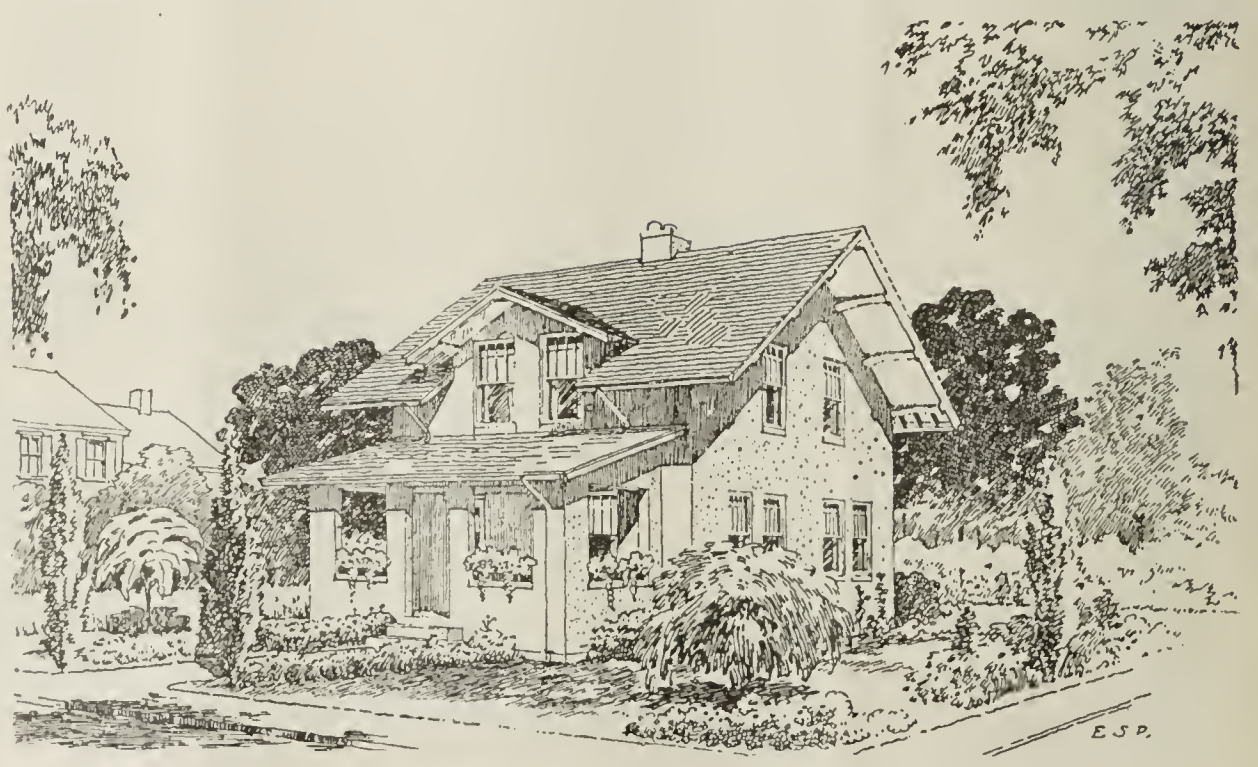
Plastering itself should be carried on continually in one direction without allowing the plaster to dry at the edge. If it is impossible to work the full width of the wall at one time, the joining should be at some natural division of the surface, such as a window or door. In most moderate sized houses two plasterers working together can usually cover two sides of a house in one day with one coat of stucco. This, of course, varies largely with the size of the house and the ability of the plasterers themselves.

The first coat should cover thoroughly the base on which it is applied and should be well troweled to insure the best obtainable bond. Before it is set it should be heavily scratched with a saw-toothed metal paddle or other suitable device to provide a strong mechanical key. A number of large nails driven into a one by two one inch apart can be used in a very effective manner. Another method which has been used with good effect to roughen up the surface is to brush the still soft mortar with a coarse broom. The latter method may in some instances cause the fresh mortar to slip away from the wall so I believe the first mentioned methods are preferable. Whenever possible the second coat should be applied on the day following the application of the scratch coat and should be scratched in the same way as the first coat.

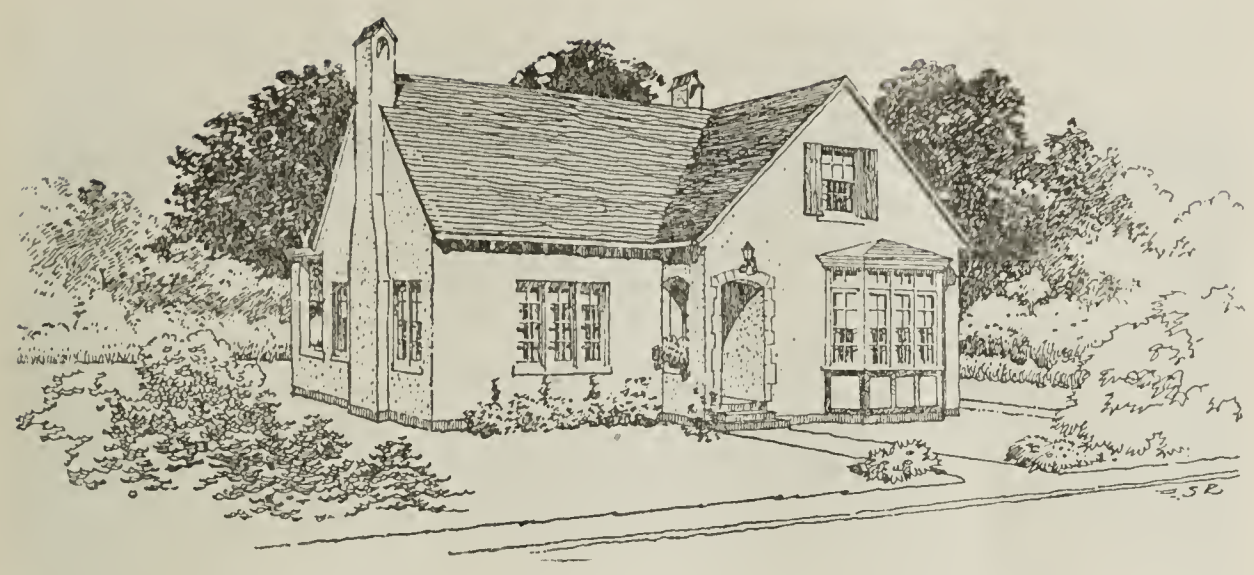
If necessary the first coat should be dampened but should not be saturated before the second coat is applied. The second coat should be brought to a true and even surface by screening at intervals not exceeding five feet, and by constant use of straightening rod. When the second coat is stiffened sufficiently it should be dry floated with a wood float and lightly and evenly cross-scratched to provide a good mechanical bond for the finish coat. The day following the application of the second coat, and for not less than three days thereafter, the coat should be sprayed or wetted at frequent intervals and kept from drying out.

Whenever two-coat work is required, the first coat should preferably be "doubled," that is, as soon as the first coat is still enough it should be followed by a second application of mortar, and this should then be treated as described for the second coat. The finish should be applied not less than a week after the application of the first coat.

The finish coat should not be permitted to dry out rapidly and extra precautions



This was designed for the residential suburbs of Duluth



should be taken, either by sprinkling frequently after the mortar is set hard enough to permit it, or by hanging wet burlap or other materials over the surface. As I mentioned before the curing of stucco is just as important as the curing of your block in order to get the greatest strength from it.

The Matter of Finishes

Now we come to the matter of finishes for stucco. You are all familiar with the common dry pebble or crushed marble dash finish. These are obtainable with portland cement stucco although it takes quite a bit of practice in order to get the best results. On the other hand, we have also the standardized types of finish such as sand float, stippled, spatter dash, etc. The latest development in stucco finishes has been the realization of the real possibilities that are latent in a portland cement mortar. The variety of textures than can be obtained is limited only by the imagination and ingenuity of the plasterer and those who direct his work. Any number of methods can be used in the application of stucco from special tools to the bare hands. Most of the effects, however, can be obtained merely by varying the manipulation of the ordinary trowel. It is not a simple matter to describe exactly how these various textures are obtained. A clever man can in a few trials imitate any finish shown in a picture. Many times new and far more interesting finishes are obtained by an attempt to imitate a texture which it is desired to copy.

Stucco can be colored in two ways; either by the use of mineral pigments or by using a colored aggregate. The latter method is preferable although it is limited because of the difficulty in obtaining the proper colored aggregates. We are, therefore, forced to the use of mineral pigments which as I mentioned before, are not entirely satisfactory. Mineral pigments are very finely ground inert materials. For this reason it is not advisable to mix too great an amount of these coloring materials with the cement. For this reason white portland cement is highly desirable since it does not obscure the colors that are used and a smaller amount of color will give a greater brilliancy to the tint. This is very easily demonstrated. You all know that a painter who wants red paint or blue paint or green paint does not start out with gray. He will mix his pigment with white lead.

The mineral pigments are most satisfactory in reds, yellow and blacks. Greens and blues are very difficult to obtain and are rarely permanent. The coloring matter should be a natural mineral pigment of about the same specific gravity as the cement in order that it will be uniformly distributed throughout the mortar and not have a tendency to float to the top in mixing. As I mentioned before there are a number of manufacturers who specialize in making coloring pigments for cement and it is advisable to use these materials. Aniline dies should never be used since the cement acts upon them chemically and fades their color. Solutions of mineral salts are sometimes used as a wash. Notable results have been obtained in the south in Florida by Hugh Orr who does an enormous amount of stucco work in that territory.

Facings for Concrete Block

So much for stucco. We will now take up the matter of facings for concrete block. We have all come to realize that far more attention should be given to beautifying concrete block, in other words, producing such a block as will enable you to sell them not only for foundations but for work above the surface. In the end it will prove more than worth while for in that direction lies a great possibility for growth of the concrete block industry. We have seen how we can put a pleasing and lasting finish on a rough textured concrete block by means of stucco, however, as you all know—and there may be some among you who are prejudiced against the appearance of stucco or who would like to have a house built of stone—stucco is of course the easiest and probably the most economical solution to the problem of getting the concrete block above grade. But there are many who will prefer a concrete block with an attractive surface finish to stucco just for the sake of variety or perhaps because of personal preference.

There is no question that the usual concrete block is monotonous in appearance. Its uniform texture, dull gray color and the lack of contrast are displeasing to most people. The first attempt at solution of this problem was the casting of the block in imitation of stone but that did not remedy the drawback because the sameness of the rock faced block is displeasing to most people. Experience has taught us that the concrete block with an imitation rock face or dead, gray cement color will always have a limited field. It may be structurally strong and satisfactory, but from the viewpoint of appearance it is unattractive.

The use of white portland cement for facing makes it possible for manufacturers of concrete block and brick to give their products a variety and beauty of finish that can hardly be obtained with regular gray portland cement. The same truths hold in the facing of block with a white cement as hold in the use of white cement for a finish coat for stucco work. Those who have tried the making of attractive facings by the use of colored aggregates and white cement have found that a block or brick so finished has a far greater sales value because it is undoubtedly more attractive than the ordinary block. It will sell at a higher price and owners and architects will employ such products when they will not consider for exterior use a block or brick made with the usual finishes.

Attractive appearance is secured by making the surface that is out of the ordinary either in texture or in color. Rough textures can be secured for example by using the coarse materials throughout so that when the block is removed from the machine the surface is rough. There is no definite formula for producing such a surface and only experiment will show what can be done with a given aggregate.

The most satisfying finishes, are those which can be produced by using a colored crushed stone with white cement or with white and gray mixed. As you all know colored stone chips are now marketed by many concerns both for this purpose and for use as a dry dash with stucco. Coloring pigments are sometimes used but the results cannot be said to be so attractive as when a colored aggregate is employed. In general the preference is for the lighter and more subdued color effects which are obtained by the colored aggregates with a lighter background of cement. At a short distance the various colors blend into effects that are extremely pleasing.

One very striking recent example of this is the "Fountain of Time" in Chicago which was made of concrete using a spe-

(Continued on page 36)

Opportunities in an Own Your Home Exhibit

How Manufacturers Co-operated to Show How Well and Economically Homes Can Be Built

Chicago's third annual Own Your Home show, held in the Coliseum, March 24-31, under the auspices of the local real estate board, was a distinct success. Not only was it the largest exposition of its kind ever held in the West in the number and variety of exhibitors represented, but it attracted larger and more enthusiastic crowds than have ever turned out this side of "Bagdad on the Hudson" to witness something more substantial than sensational. And, while lacking to a large extent in adequate representation from the cement industry, it is worthy of more than passing comment in these columns, for a number of reasons.

For one thing, it was well conducted—thanks to the administration committee, composed of prominent members of the Chicago and suburban real estate boards, and to the various exhibit committees. From the time when "Home Sweet Home" was sung from the steps of the exposition bungalow by Marion Barton, star of "Blossom Time," during the opening ceremony, until the final curtain fell on the following Saturday night, there was enough of zip and go, enough of variety to satisfy the most exacting. Each day following the first Saturday, when a special celebration of the hundredth anniversary of the writing of "Home Sweet Home" by John Howard Payne was staged and greetings from President Harding were read, was given over to some special phase of home planning, decorating, or some interesting information on where to own a home. Monday, for instance, was "Plan a Home" day; Tuesday, "Decorate a Home" day; Wednesday, "Evanston, North and Northwest Suburban" day, etc., etc.

Also the exhibits—more than 200 firms displayed their specialties in building material or furnishings—were well laid out for exposition of this kind. There have been shows, separate and collective, where the various booths seemed to have been placed without rhyme or reason, but this was not one of them. The displays were clean and attractive, for the most part; and the management's avowed intention of showing everything in its proper environment was carried out to a very pleasing extent.

But the most interesting—and from the standpoint of the cement industry, the most pertinent—fact about this exposition was the pains certain exhibitors took to lift their displays out of the purely "ballyhoo' class and make them genuinely educational. Take the full size five-room stucco bungalow, built right in the Coliseum by the Holabird Construction Company from materials furnished by exhibitors, for example. This was undoubtedly the feature attraction and deservedly so. It had news as well as advertising value. It was built, equipped and furnished in less than five days and the newspapers made mention of the fact that a speed record in construction had been established in making it ready for public inspection. Crowds stood in line to get in it, visited every room (including the bathroom) and came out convinced that it could be done after all and that mighty attractively. W. S. Holabird, the contractor, said: "We believe by showing the public that construction can be done in a thorough manner in a short time, that hundreds and perhaps thousands of people will be encouraged toward home ownership." The bungalow was designed by Architect R. C. Spencer, an expert on the small house problem, and was built to show the development of a new style known as the "American style." When lots were drawn to see which concern should have the honor and the advertising of furnishing the roofing material, the Hawthorne Roofing Tile Company, of Cicero, Ill., won and put what might be termed the crowning glory, in the shape of a blending of red tilings, on an all around attractive job. (This same roofing company, by the way, had made arrangements to roof a house with its concrete tile within an hour after the show first opened and by Tuesday night had arranged to do for fifty houses what they so neatly did for the exposition bungalow.)

If it were not for its background, Tiny Town would be hard to distinguish from a real suburban block.

Possibly the matter of space or building restrictions would not permit of a house of concrete blocks being built on the floor of the exposition—we don't know—but did anybody in the cement industry take the trouble to find out? No one could say.

Another feature exhibit was that of the Harris Brothers Company's "Tiny Town." A clever and attractive idea, painstakingly worked out to the last detail. "Tiny Town" represented an entire suburban block in miniature, landscaped in detail and designed to show the importance of attention to the exterior setting of the home. Tiny model homes in different constructions and materials, some with garages—one with wash on the line, even,—were grouped in a harmonious block treatment. This exhibit attracted a great deal of attention and brought forth much favorable comment on the skill, patience and ingenuity of its makers. Incidentally, its sidewalks and flanking streets were of imitation concrete.

The possibilities of such an idea are practically unlimited. Why not a concrete city in miniature, with a concrete boat on a real if tiny river. A concrete bridge to span that; real concrete walks, driveways, and streets, etc., etc. Would the reward be worth the effort? Again we can't answer, but we happen to know that the Harris Brothers Company made such a hit with Tiny Town that they had arranged to use twice the space next year before the show was half over.

"Daddy, what's that man got?"
"A block, son."
"What kind of a block?"
"A concrete block."
"What makes it so dark?"
"It's a concrete cinder block."

Front view of the full size, five-room bungalow, built in the Coliseum by the Holabird Construction Company, from materials furnished by exhibitors. It was the feature attraction of the exposition.

The Straub Fireproof Block Company, of Forest Park, Ill., was distinctly "among the present" at the Own Your Home show, and did considerable business from the booth.

"What's he doing now?"
"Driving a nail in it."
"Don't April fool me, daddy."

Some such conversation as that took place not once but many times during the show in front of the booth maintained by the Straub Fireproof Block Company. This concern found the public not only curious to see a nail driven securely and safely into a concrete cinder block, but very much interested in the possibilities of the product as a home building material. Adjacent to its booth was the Concrete Products Association's display which attracted its full quota of visitors and did much to help sell the public on the "concrete for permanence" idea.

The Universal Roofing Tile Company, of Chicago, makers of concrete tile, the National Steel Fabric Company, of Pittsburgh, the Wisconsin Lime & Cement Company (who were also represented in the exposition bungalow with Elastica), the Crawfordsville Indiana Foundry Company, of Crawfordsville, Ind., makers of roof tile machinery, the C. S. Wert Company, of Kendallsville, Ind., makers of concrete machinery, were among the other exhibitors at the show. That they found the show-going public genuinely interested in their products is evidenced by the fact that the C. S. Wert Company, for example, had sold $11,000 worth of concrete machinery by Wednesday night (according to dependable information), and the Wisconsin Lime & Cement Company, for another example, had sold $50,000 worth of its specialties by the same evening. Evidently it pays to show the things that make for permanence, as well as attractiveness and convenience. in home building to the American public.

And yet the cement industry as a whole was not particularly well represented at the exposition. Why? Certainly not because there is any lack of sympathy in the industry for the Own Your Home idea. Nor is there any tendency on the part of its constituents to overlook the significance of a movement that makes for solider, happier, more progressive citizens, as this and other kindred drives are doing. Then what's the answer?

Possibly the very fact that everything is constructed with Aladdin-like speed and airy-fairy-ness for an exposition such as this (and for practically all expositions, for that matter) tends to discourage the exhibitors of more substantial things such as concrete products who need more time to get a display ready and find it more difficult to make one attractive and educational than many others do. But neither of these obstacles is insurmountable.

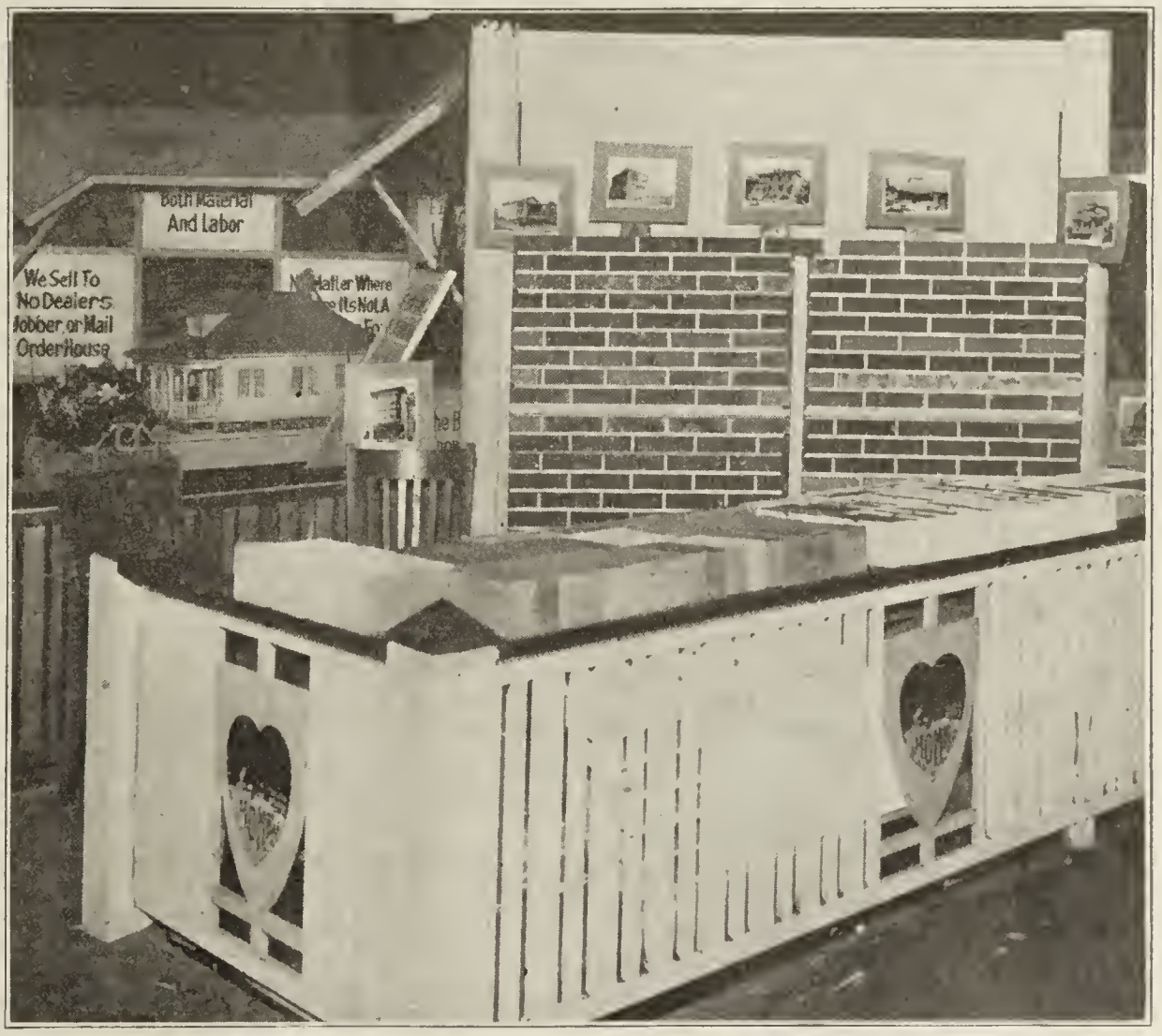
There must be plenty of ways to show the public how cement figures in and can figure in the building of homes, without spending a fortune in time and money. The average American, while he appreciates in a general way the serviceableness and usefulness of concrete, would be astonished to learn how much it has done for real estate, transportation, sanitation and what not. What a factor it has been in safe construction. How it helps other industries such as mining and railroading. We had no intention of dragging a poet into this discussion, but it might be well to remind some sections of the industry that, if there are "sermons in stones," as Shakespeare said, there must be some means for making concrete talk.

And when it talks the public will listen to it, whether the occasion be an Own Your Home show or a Concrete for Permanence demonstration.

Speaking of occasions—the nation is going to have another "Better Homes Week" this year due to the success which greeted the movement in 961 cities and towns last October. The demonstration will take place June 4 to 10. Indorsing the campaign, President Harding said:

"I know of no matter so intimately concerned with the life of our people to which we can give greater devotion and service for fundamental improvement than the upbuilding not only of individual home ownership but the actual improvement of our homes."

As a part of the campaign, communities everywhere are going to prepare model houses and apartments in tenements to demonstrate what can be done with a given income. That too should prove an opportunity worth the undivided attention of the cement industry. Will it get it?



The exhibit of the C. S. Wert Company of Kendallsville, Indiana, was the center of an interested crowd of sightseers. It is reported this company took orders for a good deal of the machines it manufacturers. C. S. Wert, the president of the company was in Chicago and was kept busy explaining the product.

CEMENT AND ENGINEERING NEWS

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"Say It With Cement"

Ever since the day that some inspired conservatory proprietor conceived the magic phrase, "Say it with flowers," similar slogans have been applied to almost every conceivable line of commercial endeavor. It remained for students of a small but noted college to use this forceful form of words in an entirely new connection, and one which emphasizes the importance of cement in construction work.

Center College, that small institution in the little town of Danville, Ky., whose team electrified the world two years ago by beating Harvard's giant football team on the easterner's own grounds, is the originator of this new idea. The students and alumni of this seat of learning and athletics desire to erect and present to the college a $55,000 stadium. For this purpose funds are being solicited. In place of the ordinary cash subscriptions, a campaign is made to have friends of the school give one or more barrels of cement, or their money equivalent.

For this campaign the slogan, "Say it With Cement," has been adopted. Donors are informed that $3.15 will buy a barrel of cement and are invited to give either the cash or the cement. This brings home the fact that, in modern construction, cement is cash and cash may be cement.

Overlooking Opportunities?

We hold no brief for the parties responsible for the Chicago Own Your Home Exposition, but we are deeply interested in the success and prosperity of the cement industry. The exposition during the week ended March 31 was characterized by a very high class of attendance, that is to say, the people coming from all directions to view what the home builders had for exhibition, were of more than the average in wealth and intelligence. The writer of this stood for over an hour at the entrance of the exposition and noted the influx of visitors. These were mostly an apparently prosperous people in earnest search of the various materials of which to build a home. They were nest hunting. Many materials claimed their full attention and a good many sales and contracts were effected and will be effected, from the conversation between those in charge of the exhibits and their visitors. What particularly excited our wonder was the lack of cement exhibits at this worth while exposition. Not one cement company seems to have been represented there. There were only a very few of cement products exhibited. These had their reward, especially one man from the Hoosier state who secured $11,000 worth of business.

With the audience eager to learn all that is best in the construction of a home in which the present and future generations might live, it seems that an exposition of this character would be an appropriate place for the cement industry to be thoroughly represented in all of its branches whether as maker, product manufacturer or the machines for making these products. It was a particularly fine opportunity to explain to the public most concerned the process of the manufacture of cement and the exceedingly costly methods which are necessary in order to produce it at the present low price. As a promoter of good will and a preventer of misunderstanding there is nothing that can equal direct contact with the people who can see and hear in person.

There are other expositions to be held in the near future and it is to be hoped that the industry will investigate thoroughly the possibilities for this direct contact good will. We feel that money spent in that way would prove a most sound investment.

The Infinitesimal Million

The naught has come into its own. Never before in the history of civilization has the zero been of such importance. Pick up any magazine, journal, newspaper or reports and you will find them full of zeros. Rubles by the billion, marks by the trillion, pounds, lira, francs and dollars by the hundreds of millions are matter of every day comment. We no longer regard a multi-millionaire with awe. To us he is rather small potatoes if he does not pay at least a million dollars a year merely as income taxes not to mention his local and state taxes.

It has come to such a pass that the matrix most frequently replaced in the linotype is the "0". The zero bar in the typewriter on which this is written is worn to such an extent that the bearings are loose and the impression is wobbly and it isn't such an old machine either. Frequently reports are printed with the terse note "The last three 000 are omitted" possibly because the compiler was wearied to death with so many zeroes. We don't blame him much.

These profound remarks were inspired by the wonderful report of the construction contracts awarded for the month of February. These amounted to $281,140,000.00 or $2.55 for every man, woman and child in the country. This is only for one month and a short one at that. By the business man this report and its facts are taken as a matter of course because he knows every zero in the astounding total represents real money and his comment would in all probability be, "Well, we can do much better than that in this country," or possibly, "Wait until we get going good, we'll show you some real figures."

We believe the business man is right. Wait until we get a real start.

The Record for 1922

According to figures, compiled by the F. W. Dodge Company and covering twenty-seven Northeastern states, the average monthly awards of building contracts for the year 1922 amounted to 44,940,000 square feet. Of this huge total 25,949,000 square feet was for residential purposes. This represents fifty-eight per cent. of all the building contracts awarded and shows an increase of fifty-two per cent. over the same class of awards for 1921.

This indicates that considerable effort has been expended in overcoming the acute housing shortage confronting the nation. From the current reports for the three months of 1923 just passed it would appear that totals for 1923 will show an even greater increase. This opinion is warranted by the number of building permits and the continued high rate of rentals in our large centers of population. As long as high rents are possible people will build in order to obtain the high rents or they will build in order to keep from paying too great a proportion of their incomes for a place to live.

Hoover Advises Restriction in Government Construction

His Reasons Why Private Enterprises Should Have Right of Way

In a letter to the President dated the 17th of the past month, Herbert Hoover, Secretary of the Department of Commerce recommends that government work not absolutely necessary be held in abeyance owing to the pressing necessity for the completion of the various programs instituted for private construction. His reply to Mr. Harding's letter gives detailed statistics from which he draws his conclusions. The correspondence follows:

DEPARTMENT OF COMMERCE
Office of the Secretry,
Washington.
March 17, 1923.

His Excellency
The President
Miami, Florida.

Dear Mr. President:

I am in receipt of your letter of March 3d as follows:

"The Administration, in one way or another, has the direction of Congress to carry on a very considerable volume of construction work. I would be glad to have the advice of the Department of Commerce as to the policy which ought to be pursued in view of the present economic situation in the building industries, with a view to determining how much to speed up on the construction program to which we are committed."

In response thereto I directed that the Department should conduct a survey of the situation in the construction trades, a summary of which is attached hereto. I shall not trouble you with the vast amount of detailed data, but these conclusions bring out several fundamentals:

1. The year 1922 was a year of very large employment and activity in the construction trades and at the end of the year stocks of construction materials were very much reduced. Since the beginning of the present year there has been even more activity than in the same period last year and the contracts let in the past few months are of larger volume than any hitherto entered into in a similar period. Advance orders for construction materials are upon a very large scale.

2. Labor in the construction trades and in the manufacture of materials is not only at full employment, but there is actually a shortage in many directions.

3. Transportation facilities available for the building materials are fully loaded and almost constant car shortages are complained of with consequent interruption in production.

My conclusion from all this is that, at least for the next several months, the trades will be fully occupied in private construction, all of which is generally needed by the country.

For the Government to enter into competition at the present moment will give no additional employment to labor and no additional production of materials, but must in the broad sense in the end displace that much private construction. The governments, nationally and locally, are in a much better position to hold construction work in abeyance than are private concerns, and are in better position to speed up in times of less demand as we did in the last depression as the result of the Unemployment Conference. We can by this means contribute something to a more even flow of employment not only directly in construction work but in the material trades.

I would recommend, therefore, that you direct the different divisions of the Government to initiate no new work that is not eminently necessary to carry on the immediate functions of the Government and that there should be a slowing down of work in progress so much as comports with real economy in construction, until after there is a relaxation in private demands.

Yours faithfully,
HERBERT HOOVER.

A Survey of the Situation

The extensive data submitted with this memorandum show that the capacity of the construction industry in the next few months at least will be fully utilized by the demands for private construction and the work of state and local government already under contract or critically necessary for maintenance.

The volume of construction carried out in 1922 is indicated by the following figures on building materials:

(Index numbers based on 1913 activity as 100)

	1922	1921	1920	1919
Lumber production	103	80	94	94
Cement production	124	107	109	87
Fabricated steel sales....	168	87	130	125

Lumber production in 1922 was above any year in the past decade, while fabricated steel sales were 16 per cent over those for 1916, the highest previous year. Cement shipments were greater than production, and were 20 per cent higher than in 1920, the previous record year.

Contracts awarded for construction work in 1922, compared with the three previous years, are shown by the following index numbers, based on 1919 figures as 100. Contracts awarded:

	1922	1921	1920	1919
Total value	130	91	98	100
Total floor space.....	102	69	72	100

Actual building activity in 1922 in relation to 1919 was greater than the figures on contracts awarded show. A large amount of building contracted for in the last months of 1921 was carried over into 1922, whereas there was practically no such carry-over into 1919.

There was practically full employment of labor during 1922, and an actual shortage of labor in many localities.

Price levels of construction materials advanced during the year as shown by the following index numbers:

Year and month	Frame house materials	Brick house materials	Wholesale prices
1922—			
January	174	179	157
February	169	174	156
March	169	173	155
April	168	172	156
May	173	176	160
June	178	181	167
July	181	184	170
August	189	193	172
September	193	197	180
October	196	199	183
November	196	201	185
December	192	198	185
1923—			
January	195	199	188
February	198	201	192
Per cent of increase February, 1923, over February, 1922 ...	17%	16%	23%

At the end of the year stocks of building materials were greatly reduced.

Since the beginning of this year building activities have materially increased over those of a year ago, as shown by the following index of contracts awarded for January and February:

(Index numbers, 1919 = 100)

	Feb., 1923	Jan., 1923	Feb., 1922	Jan., 1922
Total value	107	101	83	77
Total square feet.....	89	83	64	65
Residential, value	143	158	107	107
Residential, sq. ft.....	112	122	82	90

Actual totals in dollars for 27 northeastern states are as follows:

	Jan. and Feb., 1923	Jan. and Feb., 1922
Total value .....$	447,271,000	$343,685,110
Total square feet.....	80,558,400	60,321,300
Residential, value	212,769,900	151,431,800
Residential, sq. ft.....	47,253,300	34,568,800

The limiting physical factors in the amount of construction to be undertaken in the future are labor, materials, and transportation.

It may be said generally that labor is in full employment at the present time, and the increase in construction demand during the spring months on the basis of contracts already let indicates even increased shortages over those now existing. Considerable numbers of material manufacturers are running at full capacity, and where production capacity is under-employed at the present time it is largely due to shortage of labor.

Advance orders are greatly in excess of those a year ago. Combined figures of seven large lumber associations show an increase of 49 per cent in orders received during the first nine weeks in the year, over the same period in 1922. Unfilled steel orders of the largest company were 71 per cent greater at the end of February than a year before. Sales of fabricated steel for the first two months of 1923 were 85 per cent above the same period in 1922. January orders for sanitary pottery made a new high record for all time. Trade reports for other commodities not covered by adequate statistics indicate similar tendencies.

The transportation situation is indicated by the car shortage during the last few months as follows:

Car shortages at End of Month

	1922	1921
December	82,927	110
	1923	1922
January	73,269	642
February	80,633	599

From the above it would appear that the building and construction necessities of the country are being taken care of so far as labor material manufacturing, and transportation facilities permit, and that the addition of Governmental projects at the present time will not add to the production of materials or to the amount of employment in the country, but would in fact mean simply displacement of construction that could be undertaken at private hands.

The D. O. James Manufacturing Company of 1114-24 West Monroe Street, Chicago, has issued its bulletin No. 8 of the speed reducing transmissions made by this company. This machine is widely used in cement plants where it is giving uninterrupted service with very little maintenance. The book is well illustrated showing the design and construction of the reducer in detail and showing its application in the various industries in which it is functioning. For the convenience of the purchaser a great many pages are devoted to the dimensions of the reducing transmissions showing the horsepower ratings of each.

Testing of Concrete Building Units*

By J. C. Pinney, Jr.

Dean of Engineering, Marquette University, Milwaukee, Wisconsin.

The importance of Laboratory and Field tests of the various materials and machines is too often belittled or entirely lost sight of by many of the manufacturers and users of such materials and machines. It was not so very long ago that such tests were considered by many as a means of entertainment for College Professors during their spare time, the results of which were of no practical value and therefore of no interest to the man of practical affairs. When, however, these laboratories announced why one steel would take a temper and another would not, when they showed the electrical manufacturers where the lack of efficiency lay in their products; when they showed the cement manufacturers what results indicated a good or poor cement; and when more recently they have delved into the effects of materials, proportions, mixing and curing of concrete with the object of determinating how better concrete can be produced, their worth was realized and they became an essential part of modern industry.

If laboratory tests occupy such an important role in our industrial life, what functions do they perform? Confining ourselves to the field of particular interest to your gentlemen, it may be said that the principal object of the tests of your products is to reveal their physical properties. The three most important of these are: per cent voids, per cent absorption, and the crushing strength. By per cent voids I mean the ratio of the open air spaces to the total volume of the block as determined by the extreme exterior dimensions. By per cent absorption I mean the weight of water which the block will absorb or "soak up" expressed as a percentage of the weight of the same block when thoroughly dried by the application of heat. By crushing strength I mean the number of pounds per square inch of area required to crush the block. Of these three tests, the absorption and crushing strength are doubtless the most important from the scientific standpoint, though the voids test is of considerable importance from the standpoint of the practical side, or the requirements of building codes and other specifications.

These physical tests reveal to us the behavior of the material under those particular conditions of the test. They are indicative, but not conclusive of the material's behavior under other conditions. As far as possible, therefore, it becomes important to so conduct the test that it will give us some idea of what we may reasonably expect of the material in actual use, for this is the direct object of the tests. In very close co-ordination with this immediate object is the more far-sighted and more useful object of furnishing the manufacturer and constructor with information and data which are invaluable as guides in the manufacture and use of the material. This information is useful as an indicator not only where and how to use the material, but also as to where and how not to use it.

It thus becomes evident that test data is not confined as to its usefulness to the mere indication that such a building block absorbs a certain amount of water or requires a certain load to crush it, but rather has a far wider field of usefulness in indicating the relative physical properties of different blocks. It is, of course, unquestionable that you manufacturers are interested in and anxious to produce the best quality of blocks economically possible. But how are you to know positively that blocks produced by one method are any better than those produced by another? How are you to know that certain materials or proportions will produce better blocks than others? How are you to know that one method of curing is productive of a better produce than another? These are real and vital questions. No sane manufacturer is willing to disrupt his present methods, to change the kind or proportions of his materials nor to inaugurate a different process of curing unless he is reasonably certain that such a change will have beneficial results. The relative qaulities of building blocks made from different kinds of material or from different proportions of the same materials, or of blocks made by different processes of manufacture or curing can be conclusively determined only by actual tests. No amount of theorizing or computations unsupported by the results of actual tests can be safely considered as authentic.

In conducting tests for comparative purposes, it is essential that all conditions except those to be compared be kept constant. Failure to accomplish this renders the results not truly comparable, and has been the cause of difference in conclusions drawn from the results of much test data. If we desire to determine the comparative effect of two methods of forming building blocks, it is not only necessary that we test the products of these two methods, but it is also necessary that the materials used, the proportions (including water content) and the method of curing be kept the same for each of the two methods of forming the blocks. Otherwise the results may show no difference in the quality of the products, or may indeed show a difference which is the reverse of what they normally would be under proper conditions. With proper care resulting from a realization of these facts, the results of tests may be made exceedingly valuable to the manufacturer. In considering any change, two questions of prime importance confront the manufacturers, viz.: will the change enable him to produce a better product at the same cost? and will the change enable him to produce a product of equal quality at a lower cost? The results of tests furnish him with information regarding the quality of his product, and the costs he has himself.

I presume you gentlemen will be interested in knowing something as to the details in conducting the ordinary physical tests of your materials. Standard methods of testing have not as yet been established by the standardizing agencies such as the American Society of Testing Materials. This is probably because concrete building blocks have not as yet been used in engineering structures sufficiently to demand such. There are, however, standards established along the general line of building materials sufficient to guide the tester as to good and bad practice in conducting such tests.

The test for voids is merely a measurement of the volume of the visible "holes" in the block. This test is of value in two respects. First, it determines whether or not the sample meets the building code or other specification requirements in this respect. Second, by deducting the areas of the holes, from the gross area of the entire block, the tester determines the net sectional area for the compression test.

The absorption test is a means of determining the amount of water of a particular block will absorb. This test is conducted by first heating the specimen until all moisture is driven off. This point can be determined by periodically weighing the blocks until they lose no weight with further heating. The temperature of the block is usually kept at about 212° F. during drying, and the time required is from four hours upward. It is not uncommon practice to apply this heat for a period of twenty-four hours without intermediate weighing. After thoroughly dry, the specimen is carefully weighed, the weight recorded, and it is then immersed in water for a period of forty-eight hours. It is then removed from the water, the excess surface water is wiped or blotted off and the block is again weighed and the weight recorded as the "wet weight." The difference between these two weights (wet and dry) is the weight of water absorbed, and is expressed as a percentage of the dry weight. When waterproofing is not used in the manufacture, the absorption of a block usually runs low for the stronger ones and higher for the poorer ones. The absorption, however, is not a criterion as to the probable crushing strength. It becomes of practical value as indicating the probability of a block transmitting moisture to the interior of the wall, a rather important consideration in basement walls. Absorption is dependent upon the proportions used, particularly the amount of cement, the water content and the amount o f compacting received during manufacture, and upon the curing.

The compression test shows the load required to crush the block, and is perhaps the test requiring the most careful manipulation of any. It is from the results of the compression tests that the designing engineer is enabled to determine whether or not the blocks are able to sustain any particular load. This makes it desirable that the test be conducted in such manner that the load will be applied in the same direction as would obtain in practice. It is also essential that the load be applied uniformly over the entire area. This required the heads of the testing machine to be parallel to each other, which requirement is well accomplished in modern machines by having one or both of the compression heads provided with spherical bearings. This feature alone, however, will not insure proper uniformity in the application of the load, for in any concrete block there are numerous rough places on the compression faces and projecting particles of the aggregate. If the steel heads of the machine are brought to press directly against these projections a wedge-like action is exerted upon the block and rupture will be caused by other than pure compression. Furthermore, in the actual use of the blocks in construction these projections do not come in contact with one another, but are cushioned by the mortar joint. In order to make the compression test represent the true strength of the block we, therefore, inbed both faces of the test specimen with a layer of plaster of paris. This plaster of paris is applied to the faces of the block which is then placed in the ma-

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*Speech made at Wisconsin Concrete Products Manufacturers Convention, Milwaukee, Wis., February 20th and 21st.

Advertising That Will Sell Products*

By James W. Fisk,

Merchandising Counsel, Milwaukee Journal

Advertising is a mighty force!

Imagine if you can the task that confronted Jay Cooke in personal solicitation of funds to finance the civil war and then revert to the recent world war and think of the stupendous sums in the form of Liberty Loan and Red Cross subscriptions that were raised solely by advertising. Not only did advertising secure this vast amount of money quickly and economically but it engendered a spirit of loyalty to the flag, a sentiment of co-operation for the general good, a co-ordination of effort that did much toward the winning of the war.

Governor Miller of New York is reputed to have said recently in an address that advertising today exerts a more potent influence in molding public opinion than even the news and editorial columns of publications. Certain it is that advertising has done much to uplift and educate humanity. The poorest man of today has more comforts than the rich of a quarter of a century ago.

Due to the advertising in newspapers and other publications of low cost, every individual today no matter what his station in life is better informed than in the past. Advertising has increased the standard of living in all classes and there is no doubt of its influence in establishing customs.

Advertising induces people to wear furs in the summer and to be lightly clad in the winter. Years ago only women of the underworld painted their faces—last year advertising sold $750,000,000 worth of cosmetics and the woman of today would feel out of place without beautifying equipment.

Not so long ago, gum chewing was considered poor form—today Wrigley sells upwards of $40,000,000 worth of chewing gum a year, builds magnificent buildings with part of the returns and rumor says expends a goodly sum in the purchase of an entire island for recreation.

Some of you may remember what we called the cigarette smoker of yesteryear. Nearly one and one-half millions of dollars worth of cigarettes were smoked in Milwaukee trade territory last year.

Ten million automobiles take their owners out into the open spaces because of advertising. Sunsweet prunes are playing a role of ever increasing importance in building the health of the nation. There is nothing mysterious about the formula for making Ivory soap so I am told, yet who would question its purity or desirability.

Advertising has added a new word to the dictionary and has made kodak synnonomous with camera. Through advertising we are induced to own radio outfits and listen to the bed time stories of Forth Worth, Texas, the religious services of Pawtucket, the baseball scores of Kansas City, and orchestral strains from Detroit. The phonograph of today brings jazz music to thousands of terpsichoreans, yes, and culture to thousands of homes.

The owners of a nationally known drink sold out recently for $25,000,000 with tangible assets of only five millions because advertising has built up an intangible asset in the form of good will that was worth more than twenty millions.

From a social standpoint advertising has been a great factor in education and because it has stimulated production and consumption has given employment to thousands of men at good wages.

In applying the principles of mass selling it has wrought economies in distribution similar to those resulting in manufacturing because of mass production.

Advertising has made us a nation of brand buyers!

Ask the department store merchandise man and he will tell you that the proportion of advertising goods in his stocks is rapidly increasing. Because advertised goods sell easier and therefore offer more rapid stock turnovers, there is a greater profit made, on the investment.

Advertising breeds confidence!

Unconsciously we feel that if the goods are advertised they must be good. Advertising offers a short route to the domination of the selling field. In the local markets' forty-five per cent of the entire consumption of toilet soaps is of one brand though there are ninety-three other brands being sold here. Out of thirty-nine brands of pork and beans, one brand sells forty-five one eighth per cent of the entire volume. Ninety-eight and five tenths per cent of the people in Milwaukee drink coffee, yet one local brand sells twenty-three per cent of the entire amount. One person in every eight in Milwaukee asks for a certain brand of breakfast food—advertising. The native sons of California have sold their state to tourists. Egypt is being advertised now as never before through the finding of King Tut's tomb. Steamship companies are cashing in big on this publicity. Egyptian styles will in all probability dominate fashions.

To Get Sales Volume

Given a good product it merely remains for you to present your story in the proper manner to secure confidence and sales volume I am assured that concrete block are more permanent as building materials than any other form. Like the Prudential, they are as firm as the rock of Gibraltar. Unless I am misinformed they make for a construction that is warm in winter and cool in summer. Their strength and fire-resisting qualities together with the economy in building upkeep from the use of these materials should recommend their use to all home builders. Added to the saving in time because of the larger construction unit is I am told a smaller cost for material. The adaptability of concrete to various architectural forms makes possible the attainment of beautiful effects without great difficulty.

A Lesson of Importance

Take these facts, present them in clear understandable form, weave in some of the romance of the Eddystone light house which made of concrete withstood the elements for more than a century, picture the country estate with concrete walks, swimming pool,—tell of the cohesive qualities of stucco and concrete block—give your message to the public in homeopathic doses so that it may be assimilated, drive home the advantage of your product—advertise and make concrete block the standard above the ground just as it has become below. Play on the instincts. When a certain manufacturer wanted to sell steel fencing he ran an advertising campaign to induce the planting of certain fodder with the natural result that because of raising more small stock to consume this fodder his steel fences were in demand. The indirect attack of this nature is often valuable.

Get the vast army of renters to realize that owning a home is less expensive and more satisfactory and you have started a demand for concrete blocks. Play on a man's pride of possession. Talk "Own Your Own Home." Get him to appreciate the importance of being a property owners, a real factor in his community, the safety from the standpoint of his children of accumulating shelter and an es-

(Continued on page 37)

Advertising sells the products of this factory

*Speech made at Wisconsin Concrete Products Manufacturers Convention, Milwaukee, Wis., February 20th and 21st, 1923.

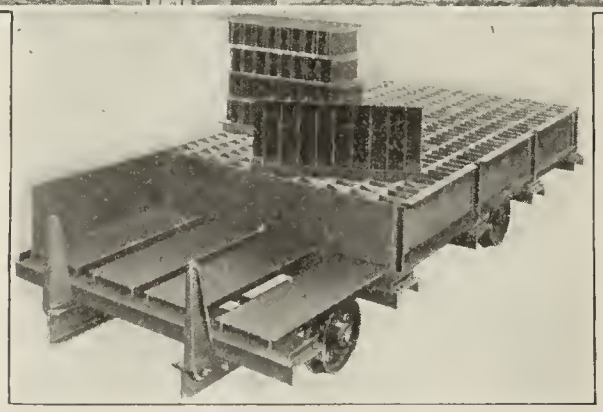
Makes Concrete Bricks Cheaper Than Clay Bricks

A process of casting concrete bricks in multiple molds, 400 at a time, and making possible the handling of the cast bricks in units of ten at a time—a process so simple that one man can make four thousand bricks a day—has been perfected by the Zagelmeyer Cast Stone Block Machinery Company, of Bay City, Michigan, manufacturers of the Zagelmeyer system of multiple molds for casting granite veneered concrete building blocks.

Experiments have been conducted for nearly ten years by this company in the effort to develop a practical method of manufacturing concrete bricks at a cost which would make the use o f concrete bricks commercially economical. Two years ago, Frank Zagelmeyer, president of the Zagelmeyer companies, perfected the present molds and began the manufacture of concrete brick on a commercial scale in the three large block plants operated by his concern. The experiments during the two years conclusively demonstrated that concrete bricks could be manufactured by the Zagelmeyer system at a cost below that of making common clay brick, making it possible to offer concrete bricks to the building field to compete with all other kinds of brick.

The saving in time and labor is the principal explanation of the low cost of concrete brick made by the Zagelmeyer system. The cost of the materials in the manufacture of concrete brick is considerably higher than the cost of material for production of clay brick, but the new system more than offsets this in a reduction of labor costs thereby placing concrete bricks in an advantageous position in trade competition. They can be sold for less than any other brick, and can be used for practically all purposes for which building bricks are used.

The Zagelmeyer system of multiple molds consists of forty, open end units, each holding ten bricks, or 400 molds in all, mounted on a roller bearing truck. The molds can be quickly set up on the truck, and the truck run under a concrete mixing machine where the slush concrete is poured directly in the brick molds. The truck is then run into heating tunnels or kilns, heated with steam pipes, and alowed to remain in a temperature of 120 degrees for eight to ten hours before removal. This allows the concrete to take its initial set before removing the brick from the molds. The length of time required for the set to take place and the blocks to harden sufficiently to permit removal, depends upon the temperature of the air. At ordinary summer temperature. without heated tunnels, and with a fairly quick setting cement, the bricks can be removed in from twenty to twenty-four hours. The molds can be used once each day in any event.



After the concrete has taken its initial set, the bricks are ready for removal and final curing. The only handling the bricks receive during the entire process of manufacture is when they are taken from the molds and this is simplified by handling ten bricks at a time in the unite of ten molds. The workman lifts out the units and deposits the ten bricks on a pile in one operation, without handling each individual brick.

Owing to the fact that the bricks are made from slush concrete a mixture is obtained which becomes perfectly dense and free from pores, thereby insuring an absolutely waterproof brick of much greater crushing strength and considerably greater hardness than any other type of brick.

The practicability and low cost of manufacturing concrete brick under this system opens possibilities in an almost unlimited field for this new building material. The small investment required for producing bricks under this system makes it possible for small manufacturers and even contractors to enter this field.

A few tunnels can be built and a few molds mounted on truck can be purchased to start with, and more equipment added as desired. As each truck of molds has a capacity for casting 400 bricks at a time, and can be used once daily, any desired production capacity can be readily figured in terms of equipment required. Twenty-five cars of molds would give a plant capacity of 10,000 bricks per day, and a plant can be completely equipped with molds to produce this number of bricks daily for about $4,000.

The trucks used for these molds are about the same size and of the same track gauge as the ones used for Zagelmeyer multiple block molds and the many manufacturers of the Zagelmeyer cast concrete block can manufacture the brick with no other expense for equipment than the actual cost of the molds.

New W. A. Jones Catalog

W. A. Jones Foundry and Machine Company of 4406 W. Roosevelt Road, Chicago, has issued its catalogue No. 26, showing in detail the construction and operation of the Jones Spur Gear Speed Reducer. This catalogue is a complete compendium on the science of reducing speed and shows the adaptability and convenient range of application of this machine. The book is copiously illustrated with very fine half tones and with diagrams in explanation of the various functions of the machine. The Jones Spur Gear Speed Reducer is an enclosed spur gear drive which operates in an oil bath. It looks somewhat like an electric motor and is about the same size of a motor of a corresponding horsepower although it is larger in cases where a very great ratio is provided. The mechanism is so compact that one of its features is the saving of space. It is dust proof and fool proof and is so constructed that it may be used even where the air is full of dust, which makes it a favorite in cement mills practice. A good many pages of this book are devoted to the horsepower ratings for standard motor speeds and ratios, giving in a very complete form the instructions relative to the rating and selection of machines. A request on the business letterhead will secure this fine catalogue for any of our readers who so desire.

Changes in Du Pont Powder

E. I. du Pont de Nemours & Co. Inc. of Wilmington, Del., announce that Charles W. Phellis, for the last sixteen months general manager of the du Pont Company's pyralin department and for twenty years before that actively identified with the company, has decided to retire to devote his time to his personal interests. Before taking charge of the pyralin department, Mr. Phellis had been general director of sales for the company, to which position he was called from Denver, Colorado, where for three years he had been general manager of explosive sales in the Rocky Mountain district.

Wisconsin Building Codes*

By W. C. Muehlstein

Building Engineer, Wisconsin Industrial Commission,
Madison, Wis.

No one should be more interested in the development and enforcement of a building code than a producer of concrete building units. The public collectively are concerned only in the enforcement of a code which will insure safe and sanitary structures. Individuals and groups making up the public, are interested also in seeing to it that regulations do not unreasonably interfere with their welfare and business. You gentlemen want to know not only how a building code is made and enforced to insure safe construction, but also how it is affecting your business.

A building code should be a reasonable standard of building construction designed for the benefit of the majority. Supposedly such a code must be designed by the majority. Ordinary subjects can be handled by many, but there are many items in the compilation of standards which must be designed by proxy. A building code must deal with many phases of industry and public welfare and no small group of men can develop a code for general application.

The state building code is not a code of rules drawn up by any person or particular group of persons. The rules were gathered from those which had been proven to be of real benefit, from other codes, and from the experiences of the nation's authorities. Without attempting to go into the details of the way in which the state building code was drawn, an ordinary committee of able men appointed by the Industrial Commission prepared the original code. This was submitted to the public for suggested changes to eliminate possible unreasonable, impracticable or unnecessary requirements, and was adopted by the Industrial Commission only after this body was satisfied that orders contained therein were the minimum reasonable standards that would insure safe buildings in Wisconsin.

One provision in the state code affects the concrete products industry. The requirement of this nature drawn from the experiences of a brick mason or sanitation engineer or a lawyer may be of value, but probably not one that would be economical or reasonable of enforcement. There would be no need of trying to enforce a law requiring, for example, the building of a masonry wall absolutely hollow. It would make a building more sanitary but is impractical in application.

A regulation which incorporates direction of usage of a concrete product must have the endorsement of the practical producer and builder, as well as the engineer and aesthetic designer. This implies confidence in the fair-minded and unselfish attitude of the producer which our experience in Wisconsin has justified.

The Reasons for Regulation

Possibly there is in your minds the question "What is the need for regulation in the manufacture of concrete block?" In answer:

First: Those who wish to manufacture block are not equally familiar with the chemistry and mechanics of cement and sand and gravel. Second: There are some who knowing them wilfully abuse these principles. Third: Uniform standards of safe manufacture and construction can be assured only by uniform practice. In the construction business regardless of the field, the malefactor is usually the winner until his practice is discovered. The honest producer who understands his business thoroughly is the loser. It is the purpose of regulation to adjust this condition. Both the producer and the public gain thereby if properly done.

The Industrial Commission is now making a revision of a section of the state building code that deals with the product in which we are all interested. The regulation of concrete block manufactured and used at present consists of:

1 Requiring a minimum compressive strength of 700 lbs. per square inch gross area as laid in the walls. (This applies to clay tile also.)

2. Requiring a maximum of thirty-three per cent of voids in concrete block. (Clay tile is permitted to have fifty-five per cent of voids.)

3. Requiring a maximum percentage of absorption of moisture of 12 per cent of dry weight in forty-eight hours. (This applies also to clay tile.)

4. Walls in which concrete block (or clay tile) are used must be not higher than fifteen times its thickness. This applies to the clear unsupported height.

5. Concrete block (or clay tile) cannot be used in buildings more than three stories or forty-five feet in height except in curtain walls.

Changes Proposed

The enforcement of these requirements under present conditions has not eliminated the manufacture and use of undesirable concrete products. It is proposed, with your help, to change the regulation of manufacture and use of concrete building units as follows:

1. All hollow concrete building block (or clay tile) must have a compressive strength of not less than 700 lbs. per square inch gross area as laid in the wall. (No change).

2. Hollow spaces in concrete block for general use must not exceed thirty-three per cent, except that where used in one story buildings and in curtain walls not more than twelve feet in height the hollow spaces may be not to exceed fifty-five per cent. (Change is the permitting of concrete tile having up to fifty-five per cent of voids in one story buildings and curtain walls.)

3. Absorption of moisture shall not exceed twelve per cent of dry weight in forty-eight hours. (No change).

4. Concrete blocks (or clay tile) cannot be used in buildings more than three stories or forty-five feet in height, except in curtain walls. (No change).

5. Walls in which concrete block (or clay tile) are used must not be higher than fifteen times its thickness. This applies to the unsupported height. (No change).

6. Concrete block (or clay tile) cannot be used in party walls or standard fire walls.

7. New Requirement: All concrete block (and clay tile) to be used in load-bearing or exterior walls of public buildings and places of employment in Wisconsin must be branded by the manufacturer so that the identity of the block can be determined at any time. This requirement to take effect May 1, 1923. This requirement is not intended to restrict the sale of unbranded block which were made before this requirement became effective.

8. Manufacturers must have their product tested by a reliable testing laboratory and submit data to the Industrial Commission. The Industrial Commission will issue a list of approved concrete block, (also tile) for use by the public.

There is no intention of discriminating against cement products. In drafting the original requirement the qualifications of clay tile were considered a comparatively known quantity because of uniformity in the raw materials and manufacturing processes. The characteristics of concrete block were indefinite—there was too much amateur experimentation and production of poor materials. The conditions have not changed very much except that there is now hope that a concerted effort on the part of concrete products manufacturers will eliminate much of the amateur element and create confidence in their business. The change proposed is one that will give concrete products a chance to show their worth.

One feature of this revision deserves special emphasis—The requirement for branding of concrete block and hollow clay tile, and the registration of the individual brand with the Industrial Commission. With careful field supervision to insure conformance to this by all manufacturers and users, mal-practice should be eliminated.

Much of the objection to the more general use of concrete block is a prejudice developed because of the undependable product turned out by many unscrupulous or unskilled manufacturers. At present the argument that makes the most impression on a prospective purchaser or owner of concrete building unit is cheapness, and concrete block can be made as cheap as desired by sacrificing safety. There are many good achitects in Wisconsin who would give the incorporation of concrete building units in their designs much more consideration if the manufacturers of the product could be put on reliable basis. Concrete building units stay in the mediocre class because there is no incentive for developments, no large demand for use of concrete units, because most buildings are made of them are anything but imposing. This statement is not for the purpose of airing any personal prejudice. The speaker is in sympathy—desires to see the concrete building unit industry placed on a good basis for the sake of safe buildings, and thinks that the only way to accomplish this is by better control of manufacturer and use of the buiding units in some manner as outlined above.

*From a speech made at the Wisconsin Concrete Products Manufacturers Convention, Milwaukee, Wis., February 20th and 21st, 1923.

National Lime Association

The fifth annual convention of the National Lime Association will be held at the Hotel Commodore, New York City, June 13th, 14th, and 15th, 1923. The work of the convention will be devoted in a large measure to reports from the technical men of the research organization, and from the field engineers of the association.

Portland Cement Stucco

(Continued from page 27)

cial selected colored aggregate. At a distance of about twenty feet from the statute the colors of the white cement background and the various shades of buff aggregate used seem to blend but at the same time there is not the monotony of a plain surface of one color. There is certain life such a surface has which can hardly be obtained in any other way.

In general machines cast block with the face either in the bottom of the mould or at one side. When the block is cast face down the placing of a facing mixture is a very simple matter. The required amount of surfacing material which should be sufficient to form a layer from one-half inch to one inch thick is placed in the bottom of the mould. Care must be exercised to make certain that it is very nearly the same thickness throughout and that it is well packed into the corners so that there will be no possibility for the backing material to show through. It is often best to bring the materials slightly up on the sides so that if the block are laid with a raked joint the edges of the block show the same color as the face. This is really standard practice for those engaged regularly in the making of faced cast stone and faced block.

Where the face of the block is vertical the placing of the facing is a little more difficult but good results can easily be obtained. In such machines a dividing plate is used allowing the facing mixture to be placed along the sides to the required thickness. The backing material is then placed, division plate removed and the whole compacted to bond thoroughly the face and backing. If the facing mixture is merely of white cement and sand, usually no further treatment is necessary. A mixture for such a facing should not be richer than one part cement to two parts sand and may be made with one part cement to three of sand. As a precaution it is advisable to use a rose spray on the facing as soon as it is taken out of the mould or within one-half hour or so in order to remove finely divided material and neat cement which may have come to the surface.

Facing mixtures of crushed stone or small pebbles are usually made of one part white cement and two or three parts of aggregate. If there is no fine material of the fineness of sand in the aggregate, a small proportion of sand is sometimes necessary but generally none is used.

Treatment of Surface

Surfaces of this type must be treated to expose the aggregate by removing the film of cement on the surface of the particles and thus allowing their true colors to show. Several methods of accomplishing this are in use. The most generally used and the simplest is to remove the film of cement by using a spray of water on the block as soon as possible after casting. Several variations of this method are in use. Some utilize a very fine spray under considerable pressure immediately after the block is cast with the face of the block horizontal. It is claimed that this allows more water to enter the block so giving greater strength. In other cases the face is vertical, though this is sometimes objected to, as there is a tendency for the washed off cement to collect at the bottom of the face and cause streaking and for the water running down to make the bottom of the block too soggy. Another method is to use a fine light spray and brush the aggregate gently with camel's hair brush immediately after casting. In doing this care must be taken not to brush with sufficient force to dislodge any of the aggregate or to spoil the corners.

Some manufacturers wait until the block is hardened several hours and then wash the face with a stiff fibre brush, using a spray of water to carry away the scrubbed off materials. Another method is to wash the face of the block with a solution of four parts of water to one part commercial muriatic acid after the block has hardened, say twenty-four hours after it is made. Care must be taken to see that all excess acid is removed by washing with plenty of clean water.

Where a great deal of this work is done it is sometimes advisable to have a tank which can be made of concrete and lined with lead, full of a solution of one part muriatic acid and four parts of water and then dip the faced block into this acid. The joints of the lead lining, by the way, must be burned and not soldered since the acid will eat the solder. In this latter process when white cement is used for the facing it is desirable that none of the gray cement or backing come in contact with the acid since the gray cement contains iron and this when dissolved in the acid may cause streaking or staining. Of course, the block must be thoroughly drenched with water after it is removed from the acid bath in order to remove any excess acid.

Pigments are sometimes used for obtaining a colored face. This is especially true with the manufacture of brick. The use of colored facings for block is not very extensive. A method which can be followed is to mix white portland cement with white sand to which is added the proper amount of mineral pigment to give the desired color. The proportions are about one part of cement to two, two and one-half or three parts sand and not more than one-tenth part of the coloring pigment. Crushed white marble may also be used since silica sands are often slightly translucent and will not give as pure a white as a base for the color as will the crushed white marble.

As I have previously mentioned in connection with stucco, only the best mineral pigments should be used in this sort of work. In general the more highly colored facings have a greater tendency to fade than the more subdued shades which are obtained by using less pigment. If there is any doubt as to the permanency of the colors, samples to which the pigment are added should be exposed to sun and weather a few months before use.

Crazing

There is one subject in which I know you are all interested and that is the subject of "crazing". This is one of the most important things to avoid or overcome. There is a tendency for the surface of block to hair crack or craze, usually because of the formation of a film of very rich cement and sand on the face of the block during manufacture. This film expands and contracts more than the interior mass of the block and therefore will eventually crack. This action is prevented by removing the film, which can be done by one of the methods which I have mentioned before. Crazing is also caused by exposure to sun and wind while the block are still green. The obvious remedy for this is proper curing under cover.

Very often, too, I believe that crazing is caused by the aggregate that is used. I have in mind a particular instance in which three or four objects were made under as near the same conditions as possible and all were treated in an acid bath. One of these objects which was an article of garden furniture was made with a soft white marble as aggregate. The marble showed a fairly high absorption. The other objects were made with very hard aggregate, granite was one, and a very fine hard marble was the other. Neither of these exhibited any tendency to craze. These articles have been out in weather of all kinds for several years, and with the one exception, are in first-class condition.

Testing Concrete Units

(Continued from page 32)

chine and a slight pressure applied until the plaster has hardened, when the pressure is increased to the breaking load. The results of this test are recorded in pounds per square inch of both gross and net section.

In addition to the above tests, the National Association of Cement Users requires three other tests. viz.: Transverse Freezing and Fire Tests. This association, however, does not require the voids test, nor does it allow deductions for air spaces in computing the results of the other tests.

In conclusion, I would like to say a few words regarding the sampling and the data which should be furnished with the samples submitted for testing.

Samples should be selected from a stock pile in such manner as to be representative of the pile. These samples should be of sufficient age for use and should preferably be selected by a disintertested party. These specimens should be carefully packed for shipment, especially if they are to be shipped to the Laboratory by freight. We have had shipments come to us with the crate rather badly broken. The samples appeared unharmed, but upon testing one would show very poor compression results, indicating a possible incipient fracture, not visible, due to rough handling in transit. Express shipments are, for this reason, to be preferred over shipments by freight.

Certain information is desirable when recording the tests. A well conducted test should show as far as possible the history of the block up to the time of the test. In submitting samples it is well to give the following information:

1. Name of Sampler.
2. Date of manufacture.
3. Ingredients used and their proportions.
4. Method and time of mixing.
5. Method of manufacture, as
   - (a.) Hand tamped.
   - (b.) Machine tamped.
   - (c.) Pressed.
   - (d.) Wet mix poured.
6. Method of curing in detail.

It is not always possible to furnish all the above data, but it is desirable that as much as possible be furnished. In giving the proportion of ingredients used, it should be remembered that water is one of the ingredients. If waterproofing is used, the kind and amount should be stated. Not less than three and preferably five samples should be furnished for a test. When only three specimens are tested, it should be borne in mind that one low result affects the average considerably more than when five are sent.

Manufacture of Artificial Stone Products, 1921

Washington, D. C.—According to a report of the Department of Commerce the value of the products of establishments engaged primarily in the manufacture of artificial stone products amounted to $31,642,000 in 1921. This amount does not include data for establishments with products valued at less than $5,000. The corresponding figures for 1919 and 1914 were $30,455,000 and $18,954,000, an increase of 3.9 per cent from 1919 to 1921, and 66.9 per cent for the seven year period 1914 to 1921. The products of this industry include articles manufactured from a combination of stone, sand, gravel, or metal with cement, such as building blocks, building trimmings, water tanks, laundry tubs, burial vaults, etc., but not blocks or tile for paving or roofing. Concerns engaged chiefly in constructing concrete buildings, bridges, walks, etc. were not canvassed in this census, which does not cover the building industries generally.

Of the 1,122 establishments reporting products valued at $5,000 and more in 1921, 106 were located in Ohio; 103 in New York; 94 in California; 88 in Illinois; 84 in Minnesota; 72 in Iowa; 68 in Indiana; 66 in Michigan; 65 in Pennsylvania; 50 each in New Jersey and Wisconsin; 22 in Nebraska; 21 each in Massachusetts and Washington; 18 in Florida; 17 in Kansas; 16 in West Virginia; 13 in Oregon; 12 each in South Dakota and Texas; 11 in Maryland; 10 in Missouri; 9 each in Connecticut, Kentucky, and Rhode Island; 8 in North Dakota; 7 in Tennessee; 6 each in Alabama and Colorado; 5 each in Georgia, Oklahoma, and Virginia; 4 each in Delaware and Louisiana; 3 each in Arizona, Arkansas, Maine, North Dakota, and Utah; 2 each in Idaho, Montana, New Hampshire, and Wyoming; and 1 each in the District of Columbia, Nevada, and South Carolina. New York, the leading state in the industry in value of products in 1921, reported 10.9 per cent of the total value of products in that year.

The statistics for 1921, 1919, and 1914 are summarized in the following statement; the figures for 1921 are preliminary and subject to such change and correction as may be found necessary from a further examination of the original reports.

	1921*	1919*	1914*
Number of establishments	1,122	1,269	1,063
Persons engaged	9,252	12,879	15,653
Proprietors and firm members	1,053	3,055	4,089
Salaried employes	1,263	1,446	1,309
Wage earners (average number)	6,936	8,378	10,255
Salaries and wages	$10,993,000	$11,602,000	$ 7,574,000
Salaries	2,367,000	2,291,000	1,266,000
Wages	8,626,000	9,311,000	6,308,000
Paid for contract work	257,000	655,000	154,000
Cost of materials	13,433,000	13,913,000	8,904,000
Value of products	31,642,000	33,664,000	21,934,000
Value added by manufacture†	18,209,000	19,751,000	13,030,000

*Statistics for establishments with products valued at less than $5,000 are not included in the figures for 1921. There were 1,158 establishments of this class, which reported 778 wage earners and products aggregating $2,610,000 in value. For 1919, however, data for 1,516 establishments of this class, reporting 965 wage earners and products valued at $3,209,000, and for 1914, 2,485 such establishments, with 2,713 wage earners and products to the value of $2,930,000, are included in all items with exception of "number of establishments."

†Value of products less cost of materials.

The statistics shown in the following table, prepared under the direction of G. F. Loughlin, of the United States Geological Survey, are based mainly on reports of producers of Portland cement but in part on estimates. The use of estimates was made necessary by the lack of returns from four producers.

*Revised.

Stocks of clinker, or unground cement, at the mills at the end of December amounted to about 2,823,000 barrels compared with 1,949,000 barrels (revised) at the beginning of the month.

Monthly fluctuations in production, shipments, and stocks of finished Portland cement

(A) Stocks of finished Portland cement at factories.

(B) Production of finished Portland cement.

Link Belt Conveyor Price Cut

A most interesting announcement is the statement recently issued by the Link-Belt Company of Philadelphia, Chicago and Indianapolis, that the price of its portable belt conveyor, the "Cub," has been slashed over 16 per cent. This machine, illustrated, formerly sold for $700.. The new price is $585 complete with 2 h. p. electric motor, and bears the Link-Belt guarantee.

The "Cub," is even a more sturdy loader than the machine which sold at the higher figure. It weighs almost twice as much as similar machines of its size and class. The 18" wide conveyor belt is guaranteed against cutting or fraying. The speed at which the conveyor belt should run is 250 feet per minute, and with uniform feeding, has a capacity of 45 cubic feet per minute.

Prices generally are on the up-grade, and it is somewhat unusual to learn of price reductions at this time. The Link-Belt Company claims that due to the large volume of orders on hand, surpassing anything experienced in several years, the "Cub" loader was put on a quantity production basis, resulting in a large saving in manufacture, which is reflected in the new low price.

Portable belt conveyors are used for unloading and loading cars, trucks and wagons, of any loose material such as coal, sand, stone, gravel, fertilizer, foundry refuse and similar materials, replacing hand-shovelers, and aiding the labor that does this class of work, to do their work more quickly, easily and economically.

Changes in Westinghouse

Several changes in the branch offices of the Westinghouse Electric & Manufacturing Company have been announced by W. S. Rugg, general sales manager of that company. Two of the changes concern the managerships of two offices, the Baltimore and Huntington, W. Va., branch offices. C. V. Woodward has been appointed manager of the former office and F. C. Reed has been made manager of the Huntington office. R. J. Ross has been appointed assistant manager of the Transportation Division of the Philadelphia office and W. F. James has been appointed manager of the Industrial Division of the Philadelphia office, succeeding R. F. Moon, who has resigned to accept the Vice Presidency of the Atlantic Elevator Company, of New York.

Advertising Products

(Continued from page 33)

tate. Show him definitely the economy in using concrete block. Give him an idea of how easy it is to finance home building.

Scores of associations are working along this line of general promotion with great success. If advertising will sell cigarettes and cough drops it will sell concrete block, but the most satisfactory results can be secured only by a systematic program of sales promotion which constantly reiterates the virtues of concrete block. The public is prone to forget—a spasmodic burst of publicity might only excite their curiosity. Concrete products manufacturers—have a good product first, one that will do all you say it will, then tell the world, tell them convincingly and often. Advertising is the royal road to business. It will solve many of your distribution problems.

Anatomy of Concrete House

(Continued from page 22)

equipment, with marked improvement in American home building.

The Architect's Service: In the design of a home the services of an experienced architect are of supreme importance. Not only are the direct savings in construction costs he usually effects several times greater than the fee he receives, but the value of a well balanced plan and a correct and pleasing architecture exterior is greater still.

It doesn't cost any more to make your home beautiful than to have it ugly—and remember that beauty is not gained by dressing the house up with scroll saw ornaments, cut up roofs, dormers and fancy shaped windows. A well proportioned house looks beautiful without these.

In the exterior design of the house it is well to rely on well established types of architecture and not resort to the unusual or the untried. Odd or unusual designs often become tiresome; they are likely to be expensive and inharmonious as well.

Unfortunately architectural service is almost beyond the purse of the small home builder and the public is thus deprived of the beneficial influence which good architecture supplies and which goes far to make the nations homes attractive.

House Plan Service: The house plan service of the Portland Cement Association is designed to remedy this deficiency. Its purpose is to make available the knowledge and experience of the professional architect through the distribution of carefully selected plans representative of the best modern ideas by many architects of repute. Through this medium good plans are brought within the reach of many who appreciate the value of good design but to whom individual architectural service is not accessible otherwise.

Important Cost Book

No phase of business today is receiving more attention than the costs of production and the way in which cost data may be used in the determination of business policy. The importance of these questions is evidenced in the great attention given to them by the business and trade periodicals.

The National Association of Cost Accountants, with its 3,000 members in this country, Canada and in foreign countries acts as a clearing house for the collection and dissemination of cost information and in a large way is spreading the gospel of business control through accurate cost data. It has just issued its 1922 year book of 452 pages which contains a complete report of the proceedings of the third international cost conference held at Atlantic City, N. J., September 23, 25, 26, 27, 28, 1922. The book is replete with practical information of great value to cost men, managers, industrial engineers, and public accountants. The material in the year book was presented by the leading cost accountants in the country and deals with some of the most important cost and managerial problems confronting business men.

This book sells for $3.00 and it may be had by application to the office of the association at No. 130 West Forty-second street, New York City.

Portland Cement Output in February

The satistics shown in the following table, prepared under the direction of Ernest F. Buchard, of the United States Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The use of estimates was made necessary by the lack of returns from one producer.

Production, shipments, and stocks of finished portland cement in February, 1923, and preceding months.

Month	Production (barrels)		Shipments (barrels)		Stocks at end of month (barrels)	
	1922	1923	1922	1923	1922*	1923
January	*4,291,000	7,704,000	*2,931,000	5,419,000	13,316,000	*11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	13,592,000
March	6,685,000	.....	7,002,000	.....	13,848,000	.....
First quarter	15,254,000	.....	13,218,000	.....	.....	.....
April	9,243,000	.....	8,592,000	.....	14,470,000	.....
May	11,176,000	.....	12,749,000	.....	12,893,000	.....
June	11,245,000	.....	13,470,000	.....	10,718,000	.....
Second quarter	31,664,000	.....	34,811,000	.....	.....	.....
July	11,557,000	.....	13,850,000	.....	8,443,000	.....
August	11,664,000	.....	14,361,000	.....	5,746,000	.....
September	11,424,000	.....	12,444,000	.....	4,724,000	.....
Third quarter	34,645,000	.....	40,655,000	.....	.....	.....
October	12,287,000	.....	12,854,000	.....	4,149,000	.....
November	11,349,000	.....	10,167,000	.....	5,320,000	.....
December	8,671,000	.....	4,858,000	.....	9,142,000	.....
Fourth quarter	32,307,000	.....	27,879,000	.....	.....	.....
	113,870,000	.....	116,563,000	.....	.....	.....

*Revised.

Stocks of clinker, or unground cement, at the mills at the end of February amounted to about 4,586,000 barrels compared with 4,015,000 barrels (revised) at the beginning of the month.

The favorable showing of the cement manufacturing industry in the first two months of 1923 is worthy of comment. As compared with the corresponding period of 1922 production and shipments of portland cement made gains of about 84 per cent and 83 per cent, respectively, and stocks which are nearly as high as early in 1922, are maintaining adequate levels thus far in 1923.

Imports and Exports

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in November, 1922, amounted to 61,010 barrels, valued at $104,688. The total imports in 1921 amounted to 122,317 barrels, valued at $388,828. The imports in November were from Denmark, 36,853 barrels; Canada, 19,129 barrels; Belgium, 4,003 barrels; France, 1,025 barrels. The imports were received in the following districts; Porto Rico, 23,740 barrels; Vermont, 15,805 barrels; North Carolina, 14,923 barrels; San Francisco, 5,028 barrels; Washington, 900 barrels; St. Lawrence, 459 barrels; other districts, 155 barrels.

The exports of hydraulic cement in January, 1923, (portland cement only) were 73,169 barrels, valued at $214,893, of which was sent to Cuba, 27,979 barrels; to the other West Indies, 6,102 barrels; South America, 24,954 barrels; Mexico, 63,319 barrels; Central America, 6,008 barrels; Canada, 271 barrels; and to other countries, 1,536 barrels. The total exports of hydraulic cement in 1922 were 1,127,845 barrels, valued at $3,206,201.

The statistics of imports of hydraulic cement from December 1, 1922, to February 28, 1923, and of exports of hydraulic cement in February, 1923, are not available.

Imports and exports of hydraulic cement by months in 1922 and 1923.

Month	Imports (barrels)		Exports (barrels)	
	1922	1923	1922	1923
January	17,036	(b)	70,725	73,169
February	5,157	(b)	82,421	(b)
March	1,597	.....	103,556	.....
April	10,855	.....	75,412	.....
May	2,521	.....	100,068	.....
June	14,179	.....	96,263	.....
July	958	.....	119,491	.....
August	56,757	.....	105,156	.....
September	c42,641	.....	78,615	.....
October	d65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	(b)	.....	106,938	.....
	.....	.....	1,127,845	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce.

(b) Imports in December, 1922, and in January, and February, 1923, and exports in February, 1923, are not available.

(c) Imported during period September 1-21, inclusive. Imports during period September 22-30 are included with October.

(d) Includes imports during period September 22-30.

News of the Cement Mills

The Texas Portland Cement Company of Dallas, Texas, has increased its capital stock from $1,000,000 to $2,000,000.

The stockholders of the Lehigh Portland Cement Co., Allentown, Pa., will increase its capital stock from $18,000,000 to $25,000,000.

Colton Portland Cement Co., Colton, Calif., has recently experienced a big fire which destroyed electric motors and kilns, together with a number of houses.

The Knickerbocker Portland Cement Co., Hudson, N. Y., contemplates increasing the production of its plant by adding more equipment and more buildings.

The Continental Portland Cement Co., which has been purchased by the Alpha Portland Cement Co., has decided to increase the production from 4,500 to 5,000 barrels per day.

The Colton Portland Cement Co., Colton, Calif., is planning to spend $1,000,000 in enlarging its plant and aims to make it the largest in the southwest, employing an average of 1,000 men.

The Great Western Portland Cement Co., Kansas City, Mo., announces it will erect a warehouse at Mildred, Kansas, large enough to provide storage space for 200,000 barrels of cement.

The cement plaster mill of the Acme Cement Plaster Co., at Beverly, Mich., three miles southwest of Grand Rapids, Mich., has been destroyed by fire. The damage was estimated at $150,000. The plans for rebuilding the plant will be made soon.

The Dixie Portland Cement Co., Chattanooga, Tenn., is considering preliminary plans for the erection of a number of extensions to its plant, including the installation of considerable new machinery and operating equipment for large increase in production.

The Marquette Cement Mfg. Co., Marquette Bldg., Chicago, Ill., has purchased a large piece of land on Elston Ave. and the Chicago River upon which the world's largest cement warehouse will be built. L. E. Ritter, will be the engineer in charge of the construction.

Southwestern Portland Cement Co., Two Republics Bldg., El Paso, Texas, contemplates the construction of a plant for making Portland cement to cost about $1,500,000 to be erected on a site recently purchased at Waco, Texas. The actual construction of the plant may begin soon.

The Missouri Portland Cement Co., U and P Bank Bldg., Memphis, Tenn., is adding considerable to its plant in the north part of the city along Wolf River for the loading and unloading of sand and gravel. Its product was formerly handled by boat but is now handled by rail.

Columbia Cement Co., Fred A. Ballin, Pres., 6th Floor, Concord Bldg., Portland, Oregon, contemplates building a 1,500 barrel cement plant on its holdings west of Huntington, Oregon. The engineer who will design and build this plant is J. N. Webster, care of Columbia Portland Cement Co., Concord Bldg., Portland, Ore.

Dr. R. C. Morris, Grand Rapids, Mich., is promoting a cement mill on the Lake Shore Railroad, 7 miles south of Kalamazoo, Mich., where 580 acres of exceptionally high quality lime marl is located. Associated with Mr. Morris is a banker, Mr. H. S. Gray and the Hon. N. F. Simpson, the state tax commissioner. Perry laboratories, Detroit, are making the assays and surveys of the land preparatory to going before the Michigan State Finance Commission for a charter.

Guadalupe Lime & Cement Co., San Jose, Calif., is preparing to build the largest lime and cement plant in the country, to cost approximately $2,500,000. The company has secured about 1,000 acres. The capacity of the plant will be about 1,800 tons daily. Preliminary surveys and right-of-way construction have been goin on for the last 14 months. A huge tunnel will be built passing through the property of the company to connect with the branch line of the Southern Pacific near Alamaden Station.

Unless the demand for cement increases even more rapidly in China than it has during the past several years there is a possibility that exports of that commodity to the country in question may be lessened by domestic manufacture of the stuff. According to Consul J. K. Davis, Nanking, the greatest demand for cement in China occurs in Shanghai, with Nanking in second place. These two cities are connected both by river and railways, and the transport of commodities produced in one to the markets in the other is both quick and cheap. As the greatest market possibilities exist in the Yangtze Valley, Mr. Davis asserts it is the logical field for cement production.

"There are now no plants working in this district," he continues in a report to the Department of Commerce, "but the China Cement Manufacturing Company has almost completed its plant at Chuyung, a small village thirty-four kilometers from the City of Nanking, and expects to begin operations in the spring. The capital of the company, which will have its head office in Shanghai, is 500,000 taels, equivalent to about $380,000 American currency. The works are being built at Tiger Hill, which is approximately one mile from the Shanghai-Nanking Railway at Lungtan. A spur of slightly over one mile in length has been constructed between Tiger Hill and Lungtan. The daily output of the workers is estimated at 400 barrels of 375 pounds each."

The cement industry of the United States last year used over 3,800,000 pounds of grease and over 3,700,000 gallons of lubricating oil costing well over $1,000,000, according to statistics compiled by the Portland Cement Association. The grease requirements of the industry during 1922 would supply more than 187,000 automobiles for a 5,000-mile trip, and the lubricating oil used on cement machinery would operate over 42,000 taxicabs for a year, with each cab using one quart per day.

Although a low grade of oil is suitable for some of the heavy kilns and crushers, the power plants and finer machinery demand the highest quality lubrication, and only the best oils are used. In addition to that of the heavy grinding and crushing machinery, constant lubrication is necessary on steam shovels and railroad equipment, from the quarry to the mill, sacking machines, sack cleaning, and repairing machines, and other mill equipment.

In spite of the frequent and generous use of grease and oil, the life of machinery in cement plants is probably less than in any other manufacturing industry. One out of every five operative employes in a cement plan is required for repair work.

Producers of Portland cement say in explanation of the present situation that there is no shortage in the production of the commodity, but that the problem is one of delivery. In other words, they say that dealers in all regions have responded to the advice of the producers that they should buy early to insure supply instead of waiting until later in the season and that the result is a scarcity of cars now, instead of at the period of mid-summer activity.

The demand for cement was unusually heavy on the 30th, with dealers reporting that some producers are refusing to cover on future jobs at present price. Portland cement increased 15 cents a barrel, mill price, in Wisconsin territory last week. The same advance has been in effect in eastern markets for about three weeks. In this market the wholesale mill price still is $2.50, with the markets strong at that figure.

Shipments and delivery are now the big problems of producers and dealers of building materials in all lines. In anticipation of a demand that will tax present transportation to the limit, many local dealers are adding new trucks for the building materials interests is reported to be the most active in history of the industry.

The ruling retail prices in the Chicago market follow:

	Per bbl.
Portland cement	$3.00
Bulk lime, Wis.	1.50
	Per Yard
Lake and bank sand	$3.00
Torpedo stand	3.00
Crushed stone, gravel screenings	3.00
	Per Ton
Hydrated lime, Ohio paper	$20.00
Hydrated lime, Wis. paper	18.00
Neat plaster	17.00
Prepared plaster	14.50
Wood fiber	17.50
Tile—	Per Foot
3-inch gypsum tile	.12
4-inch gypsum tile	.14
Partition Tile—	
3-in. clay, per M feet	$82.50
4-in. clay, per M feet	88.00
6-in. clay, per M feet	121.00
8-in. clay, per M feet	165.00
Flue Lining—	Per Foot
4x8 inches	.18
8x8	.24
8x12	.36
12x12	.46
18x18	.90
Coping—D. S.—	
9-inch	.16
12-inch	.24
18-inch	.52
Sewer Pipe—	
3 and 4-inch	.15
5 and 6-inch	.22½
8-inch	.35
9 and 10-inch	.52½
12-inch	.67½
Face Brick—	
Smooth iron spots	45.00@48.00
Indiana red, rough	30.00@32.00
Indiana red, smooth	30.00@32.00
Smooth, buff	45.00@48.00
Ohio red, smooth	40.00@42.00
Pennsylvania red, smooth	45.00@48.00
Smooth, gray	48.00@50.00
Smooth silica slag, gray	23.00@25.00
Chicago common	12.00

—*Chicago Journal of Commerce.*

News of the Concrete Products Factories

Fargo Stone & Sand Co., Fargo, N. D., contemplates manufacturing concrete blocks in the near future.

The California Concrete Vault Co., San Dimas, Calif., has been recently incorporated with a capital of $25,000.

G. A. Davidson, 1825 F. St., N. W. Washington, D. C. wants prices and catalogs on concrete block and roofing tile machinery.

The Duluth Concrete Manufacturing & Supply Co., Duluth, Minn., has been recently incorporated for $50,000 by Harvey Hosheur.

Paullina Cement Tile Factory, R. W. Young, Prop., Paullina, Iowa, may install a sand washer as the trade seems to demand washed sand.

Thomas & Borst, Rochester, N. Y., has been recently incorporated with a capital of $25,000 by W. and W. Thomas and J. Borst to manufacture cement blocks.

The Erie Brick & Cement Product Company, a $50,000 corporation has been formed by the citizens of Sandusky to take over the property of the Hinde Brick & Tile Co.

Leeds Concrete Products Co., H. M. Judge, president, Leeds, Ala. has been recently incorporated and will establish a plant for the manufacture of concrete brick and pipe.

Kabell Concrete Products Co., Huntington, W. Va., has been incorporated for $25,000 by S. E. Cook, of Huntington; V. O. Weathers, of Ashland, Ky. and W. O., Brewer of Chillicothe, Ohio.

H. G. Roethel, Ft. Atkinson, Wis. operates a Universal Machine Co. block machine and an Iowa Batch mixer. Contemplate making brick in the near future. Wants prices and catalogs on crushers and tampers.

Wm. P. Roder and J. Michael Shertzer of Cumberland, Ind., have purchased the property of Philip Knopp on Highland St., on which they will erect a modern concrete block manufacturing plant. Machinery for the plant has been purchased and erection of the building will be started promptly.

Coast Concrete Products Co., Huntington Park, Calif., has been recently incorporated with a capital of $50,000 by B. Rosin, president, M. F. Pollosky, Secy.-Treas. and S. Flan, Superintendent and when their new plant is completed and in operation, will have a capacity of 3,000 to 4,000 concrete blocks of various sizes.

R. H. Eastwood Sand & Gravel Works, Graysville, Ill., wants prices and catalogs on building block machines, building and partition tile, drain tile and brick machines. Also interested in mica spar crystals, white sand, marble chips, waterproofing compounds and white cement. Writes us as follows: "We expect to erect a concrete products plant this summer."

Southern Cement Products Co., Harvey Ferrin Pres., 521 Menchaca St., San Antonio, Texas, has been recently incorporated with a capital of $25,000. Wants prices and catalogs on roofing tile machines, building blocks, building and partition tile, floor tile, vases, park benches, septic tanks, and flower boxes. Also interested in mica spar crystals, white sand, marble chips, waterproofing compounds and white cement.

The Plastic Products Co., 956 Macomb St., Detroit, Mich., has been recently incorporated with a capital of $25,000 to manufacture plastic cement products, etc.

The press dispatches state that the National Stone Tiling Company of California is investigating locations for the establishment of a factory on the Pacific coast.

Nepperhan Concrete Products Manufacturing Corp., Yonkers, N. Y., has been recently incorporated with a capital of $15,000 by C. A. and E. M. Morales and L. P. Myers.

The Cerro Gordo Brick and Gravel Co., Mason City, Iowa, has been recently incorporated with a capital of $150,000 by H. C. Boyd, C. L. Snyder, both of Mason City, Iowa and M. Pool, Elkader, Iowa.

Kost Bros, Downer, Minn., operate a Dunn building wall tile machine and Dunn drain tile machine, Ideal Machinery Co., block, silo molds and tamper machine, and Blystone mixer. Write us as follows: "We are interested in a brick machine that will compete with clay products, together with other machines for making silos, building blocks, chimney blocks, fence posts and brick machines. Also interested in mixers, crushers, transfer cars, white sand, marble chips, waterproofing compounds and white cement.

A new use for cement has been discovered in Germany according to the *Philadelphia Inquirer*, which says: "Manufacturers in Germany are now making buttons out of cement. Mechanical filling machines bring a cement mixture into automatic presses, which form the buttons and stamp the small holes in them. The buttons are then hardened under steam pressure. Next they are pushed between two wheels. The buttons are then ready to be colored, which is done by spraying similar to the method used in coloring ivory, nut and horn buttons. In spite of heavy increases in prices of German cement, it is still a very cheap material for this purpose, and the fact that the buttons can be produced automatically in great quantities is likely to make possible the extensive introduction of the cement button."

Although cement is widely used these days in building construction of all kinds the cost of cement is surprisingly low in comparison to the total cost of the structures. After an exhaustive survey of comparative costs by the Cement Information Service, the following report was made:

"Reliable data shows that the cost of the cement used in a single house or even in a reinforced concrete structure is but a small percentage of the total cost of such house or structure—varying from about 2 per cent in the cost of an ordinary dwelling to something like 7 per cent in the cost of a reinforced concrete structure.

"In the average suburban or country dwelling house, with cement sidewalks etc., costing $8,000 to $10,000, the cost of cement varies from 1½ to 2 per cent of the total cost of the building.

"In typical office buildings of fireproof construction the cost of cement varies from 1½ to 3 per cent of the total cost of the building. In a typical apartment building it varies from 1.7 to 2.1 per cent of the total. Even in concrete buildings in which foundations, walls, floors and roof are concrete, the cost of cement averages about 7 per cent of the total cost of the building.

"In dollars a variation of 10 cents a barrel in the market price of cement makes a total difference of about $5 for each $10,000 spent in housing construction."

Link-Belt Exhibit at Road Show

The Link-Belt Company, of Chicago and Philadelphia will exhibit its most improved road building machine at the U. S. Good Roads Show to be held in the Textile Hall, Greenville, South Carolina, April 16th to 21st, inclusive. The exhibit will occupy spaces No. 116, 117, 118, 144, 143, and 142,—the second exhibit to the left of the main entrance.

The outstanding feature of this exhibit will be the one-man power-swiveling portable loader, for handling materials from stock piles into wagons, or concrete mixers, horse carts, trucks, barrows, and so forth. This machine backs right into the pile; swivels easily, in either direction, while loading, yet is always under the control of one man. It does not require either hand shoveling or automatic feeders to keep the material within reach of the buckets.

Du Pont Distributes Stock

Wilmington, Del., April 1, 1923.—The du Pont Company has just distributed to its employes 14,484 shares of its own stock, of a par value of $1,448,400, and $130,000 in other securities as the matured portion of bonus awards made during the years 1918 to 1921 inclusive. This distribution is in line with an amendment recently made to the company's bonus plan, which shortens the period between the bonus award and the delivery of the stock certificates. The bonuses awarded for 1922 amounted to 2,300 shares, of a par value of $230,000. They were distributed among 300 employes.

Roy F. Imler, for the last three years associate editor of Concrete Products has resigned his position with the International Trade Press, Inc., to take charge of the service bureau of Thomas W. Noble & Co., 35 South Dearborn street, Chicago.

Mr. Imler is especially well qualified to be of assistance to those engaged in the concrete products industry. Prior to his entry into the editorial field he was engaged in construction work in the engineering bureau of Chicago. He has written many technical articles on large engineering projects, highway construction activities and concrete products plant operations.

The S. G. Taylor Chain Company of Chicago, established in 1873 is now completing its fiftieth year in the manufacture of high grade steam shovel and dredge chain. This company has just issued a new and completely illustrated catalogue showing the various details of its well known Mesaba Steam Shovel Chain and Taylor Made Dredge Chain. A copy may be had upon application to the company.

Cement
and
Engineering News

Vol. 35 Chicago, May, 1923 No. 5

The Truth About the Cement Supply

The Capacity of the Cement Mills is Sufficient to Provide for Everybody—The Danger in the Duplication of Orders

If there is any feature of any business more important than the actual availability of sufficient supply it is what the buying public considers that availability of supply is going to be. This for the reason that all men are reluctant to attempt to buy or to consider buying that which they believe to be under the pressure of a short market condition. Recent interviews, both published and confidential, with various industrial leaders, including railroad executives and construction company heads, reveals that there is a widespread question in regard to this supply situation in the cement industry. The present is none too soon for the appearance of an authortative and comprehensive statement on this subject.

The present condition in fact and in brief is as follows: The industry can produce, under reasonably favorable conditions, close to 150,000,000 barrels of cement. It does not appear that there is a sufficient supply of labor or transportation facility and of other building materials to permit a consumption of over 130,000,000 barrels. All cement producers desire to sell as much cement as is possible and will, under proper economic conditions, run as near to capacity as may be safely done. From this showing, it is clearly seen that there need be no shortage from a lack of production capacity.

You will note, in the foregoing paragraph, two peculiarities of wording which are intentional. First, cement producers will, under *proper economic conditions,* run near to capacity; and there *need be* no shortage from a lack of production capacity. The full meaning of these italicized phrases will be more clearly developed in the succeeding paragraphs. It will be shown that the season's performance rests wholly on the conduct of those elements of industry which consume cement, bearing in mind the fact here repeated, that manufacturers will produce all they have reason to believe the trade will absorb.

The Predominant Factors

There are two predominant factors in evidence in existing conditions: (a) A disposition on the part of dealers and large consistent users to carry much larger stocks in warehouses that has been former practice. (b) A disposition to over-buy for future delivery when there seems to be a danger of approaching shortage. These are the tendencies which are to be expected in the light of past experiences in the getting of cars in which to ship needed materials at certain seasons of the past two or three years. The tendency to carry larger stocks is not wholly to be condemned—in fact, it can be considered a wise precaution if not too urgently followed—but it contains an element of danger if not controlled. The policy of over-buying is wrong from every moral and ethical angle.

The president of one of the great cement producing concerns states the situation in these words: "We have noticed, time after time, that when cars are short or other causes interfere with deliveries, dealers' orders are immediately swelled, in some cases to two or even four times their requirements. A contractor requiring two cars of cement per week for a specific job will, when deliveries become slow from the company with whom he has placed the order, place similar orders with two or three or even more companies. This makes an apparent demand very much greater than the actual demand. All the cement he can use in the work is two cars per week and when he receives deliveries to this extent he cancels or defers shipment on the excess purchases." The Federal Reserve Bank, of Cleveland, comments on this situation—"Production was led astray by this practice a few years ago but we believe it will be on the lookout for any reptition of this sort of thing."

That clearly expresses the situation of the cement producers today. They are on the lookout. A student of the situation must not overlook the fact that cement making is a business requiring a very large investment of capital. Anything which tends to dislocate trade and slow up the financial turn-over period is very serious. On the item of reserve stocks alone, on April, 1 the various producing interests of the country had in reserve in their bins an estimated quantity of about 14,000,000 barrels, which represented money tied up to the extent of nearly $50,000,000. If some false influence should induce these interests to manufacture in excess of the absorbing powers of the market it would be but a short time until this reserve stock and the money involved would climb to unsupportable heights. Hence, the manufacturers rightfully will go slow, making sure that production does little more than equal current consumption, for in any other course lies destruction.

Overbuying Creates Panic Conditions

The previously mentioned tendency of trade to duplicate or treble orders in time of threatened slow deliveries has before worked to our national hurt. When the Cleveland Reserve Bank said, "production was led astray," it stated the truth very mildly. The fact is that in 1920 America escaped the most devastating panic in history by a financial miracle, and that deplorable situation was caused by this same multiplication of orders more than it was by an other one thing. The man who, wanting twenty cars of cement, orders forty, probably thinks his small inflation can have but small effect, but it is just such cases, multiplied thousand-fold, that strain financial resources to the bursting point. It might be well to briefly review the cause of the great price break of the fall of 1920, for the good of our conscience and for our guidance in the present situation. The record of a single article will be considered.

We will take a certain item on electrical motorized household equipment, using a 1/64 h.p. motor. An intensive investigation, beginning in a retail store, was conducted. The retailer had reasonable sales expectation for forty units. Thinking the "spending era" was going to last indefinitely, he calculated his season's need at seventy five, which he ordered, complete, from four different jobbers. Each of these jobbers, to be sure of being able to make deliveries, inflated their orders an average of 110 per cent, thus booking with the manufacturer total orders for 630 units where forty was the acutal anticipated requirement. The maker, playing the same game, doubled or trebled his orders for parts and raw materials until this retailer's original requirement of about $1,000 worth of merchandise was actually being filled by industry with upwards of $50,000 worth of material.

This was by no means an isolated case. The writer of this article personally traced cases involving some sixty different lines of material and found an identical story in each instance. The end was inevitable. When the retailer found his actual requirements filled and realized that he had several times that much more goods coming in, he cancelled, the jobber cancelled, and the manufacturer and raw material producer either cancelled, went bankrupt or "held the bag" as varying circumstances compelled. This same occurrence happening in practically every phase of industrial life brought about the most abrupt deflation ever witnessed and jeopardized more capital than any other chain of economic events in history.

The situation today is fraught with similar peril. Times are good and getting better. Transportation facilities in this, the off season of the year, are heavily taxed, as car loadings are today within seven per cent of ultimate capacity of the railroads to provide. Crops will

soon be moving and before long winter coal stocks will demand many cars so that concrete users throughout the land will feel inclined to order "plenty" so as to have assurance of getting "enough." In order to prevent, in the cement industry, a situation again verging on that in the fall of 1920, the individuals therein must take careful account of actual conditions with a view to accurately estimating actual needs. And many influences are at work to induce a wrongful estimate.

Take the matter of hotel and office building construction. Every day all the papers in every large center of population carry stories of new structures contemplated. A compilation of such announcements will induce an estimate of twice as much building for next year as has ever been done before. But *contemplated* structures require no materials. It is only those actually *built* which use sand and gravel, steel, brick and concrete. The deferred propositions and those cancelled outright get but little publicity, or in many cases none whatever, but close scrutiny of actual work will reveal as many of postponements and cancellations as it will of construction under way, if not more. This, of necessity, must be, for we have for the past several months been building with all the speed the skilled-labor power of the nation will permit, and our rate of construction is impossible of acceleration to any appreciable degree on account of the labor limitation if for no other reason.

It should not be conceived that this article is a story of gloom, for it is not. It is a call to conservatism and accuracy. The truth regarding our present construction outlook is plenty good enough. Today's situation, if fully understood and properly met by all concerned holds more promise of solid prosperity than has any other time within the memory of man, but, like every period of inflation, it holds within itself vast powers for its own destruction. It is these evil forces that, so far as the cement industry is concerned, this analysis is attempting to uncover and, by such exposition, render innocuous. It can safely and conservatively be said that our present construction needs are heavier than ever before. In every class of structure, residential, office, church, bank, theatre, railroad station; in every class of engineering work, railroad, bridge, flood prevention, harbor improvement, road building; in luxury lines; in everything, we need more than we now possess. So, unless evil days overtake us through our own misdeeds, we are in the midst of an extended term of prosperity.

It can be assured only by the thoughts and acts of individuals. In cement, if the manufacturers can gain a close idea of the actual requirements of the nation, they will produce the material in the needed volume. They will not, however, —indeed, they dare not, manufacture vast quantities of finished product and involve the huge sums necessary without a definite idea as to when and where they are going to be able to dispose of it Knowing that the utmost labors of the construction industry are capable of consuming only some 120,000,000 to 130,000,000 barrels, they are not going to produce 150,000,000. On the contrary, if they can sense the actual probable demand as being for only 100,000,000, having 14,000,000 now in storage, their inclination will be to make only some 95,000,000 more barrels. The only one who can help them draw their estimate upon which their production will be predicated is the dealer and large consumer throughout the country.

To do a workmanlike job of it, it is up to every cement user of any size and importance to schedule his requirements at once, as soon as possible. In doing this his apparent needs should be checked by the simple rule of common sense. Orders to cover bona fide contracts should, of course, be considered 100 per cent, provided labor and supplementary materials are going to be available, and should be placed at once. That phase of the problem is easy of solution. On potential needs more care must be exercised. It might be well to apply some rule of averages, as it is probable that every consumer or contractor can tell, from a study of past performances, just about what proportion of proposed work goes through. As regards the dealer, his job is a little easier. If all construction mechanics in his locality are busy and have been busy for some time, it is probably that they have been and are using cement as fast as it is physically possible. It is not likely, therefore, that future consumption will exceed the performance of the past few months to any great extent. Or, if this is not the case, it is probable that 1923 will equal the best year he ever had and it is possible that he had best figure on requirements equal to or reasonably in excess of that best previous year.

In estimating construction rate, close scrutiny should be given to existing housing conditions. For example, if available houses are beginning to be in excess of population requirements, or in other words, if vacant homes and apartments are beginning to appear, it is certain that the rate of construction is going to decline, regardless of the number of new structures on which plans may already be drawn. There is no man more competent to judge the requirements of his own community than is the dealer who has supplied that community for years, if he will restrain his enthusiasm and confine his estimate to a cold analysis of existing facts.

To return to the original question of whether or not there is going to be a cement shortage this year; there will be none if cement consumers order accurately, early and honestly. The factories are capable of turning it out and anxious to do so if industry will indicate in translatable terms how much it is going to consume. If industry holds off on orders and goes ahead with plans for 130,000,000 barrels to be ordered only as needed, it is more than probable that there will not be enough to go around when every one wants his at the same time. On the other extreme, if everyone gets in a rosy haze of optimism and orders two or three barrels for every one in need, orders are going to pile in on the producer in such volume as to demonstrate their inflated character and a feeling of insecurity will be induced with an inevitable curtailment of production.

Of course the producing industry is not depending wholly, or even for the most part, on the volume of current orders from which to predicate its ideas of the season's demands. The executives who are charged with the guidance of these concerns are in close touch with the general situation. They note that commodity prices generally are again advancing. Labor is scarce and, particularly in the building trades, wages are increasing. There are many who hold to the opinion that there will be a shrinkage in building activity due to high costs, and prominent men in the cement industry incline to agree with that opinion. The feeling is that production at a rate perhaps a little above that of last year is going to be sufficient and that, at present, is governing the plans which are being made for the future.

Replying to the question given cognizance in the first paragraph of this article, it can be stated as a broad and basic fact—there will be no shortage of cement this year. Enough will be manufactured to meet the entire probable requirements of the nation. The only safeguard needed to protect the needs of the individual or corporation contemplating the use of a considerable quantity of cement is to place an order for the exact amount required, and *neither more or less*, at once.

Interior of A. T. & S. F. round house, Riverbank, Cal., made of reinforced concrete.

Railway Program for Handling Business

Concerted Policy and Working Plan to Handle the Unprecedented Volume of Business Confronting Them. Making the Most of What They Have

Anticipating the greatest volume of freight traffic this year in their history, the railroads at separate meetings in New York on April 5, of the American Railway Association and the Association of Railway Executives, adopted a concerted policy and intensive working program to enable the carriers to meet the growing transportation needs of the country.

This program is set forth in resolutions which follow based on recommendations submitted in a report of the Car service Division of the American Railway Association.

Despite the obstacles placed in the way of transportation service since July 1, 1922 by the accumulative effects of the coal miners, and shopmen's strikes, the railroads have between July 1, 1922 and the present date, handled the greatest volume of traffic ever transported during any corresponding period in the history of the country.

Realizing the necessity for the greatest improvement and expansion possible of the country's transportation facilities to meet the growing demands of commerce, the railroads now have on order more cars and locomotives than ever before in their history. In 1922 they actually expended $440,000,000 for cars, locomotives, trackage and other facilities, while they have authorized expenditures for equipment and other facilities amounting to approximately $1,100,000,000 for the year 1923. This means that the railroads since January 1, 1922 have either expended or authorized the expenditure of a total of $1,540,000,000. This enormous amount of additional capital is largely being raised by the railroads through borrowing money on the abiding faith in the fairness of the American people and reliance on the continuance of the constructive policy hitherto announced by the Congress.

The resolutions are as follows:

Constructive Transportation Program

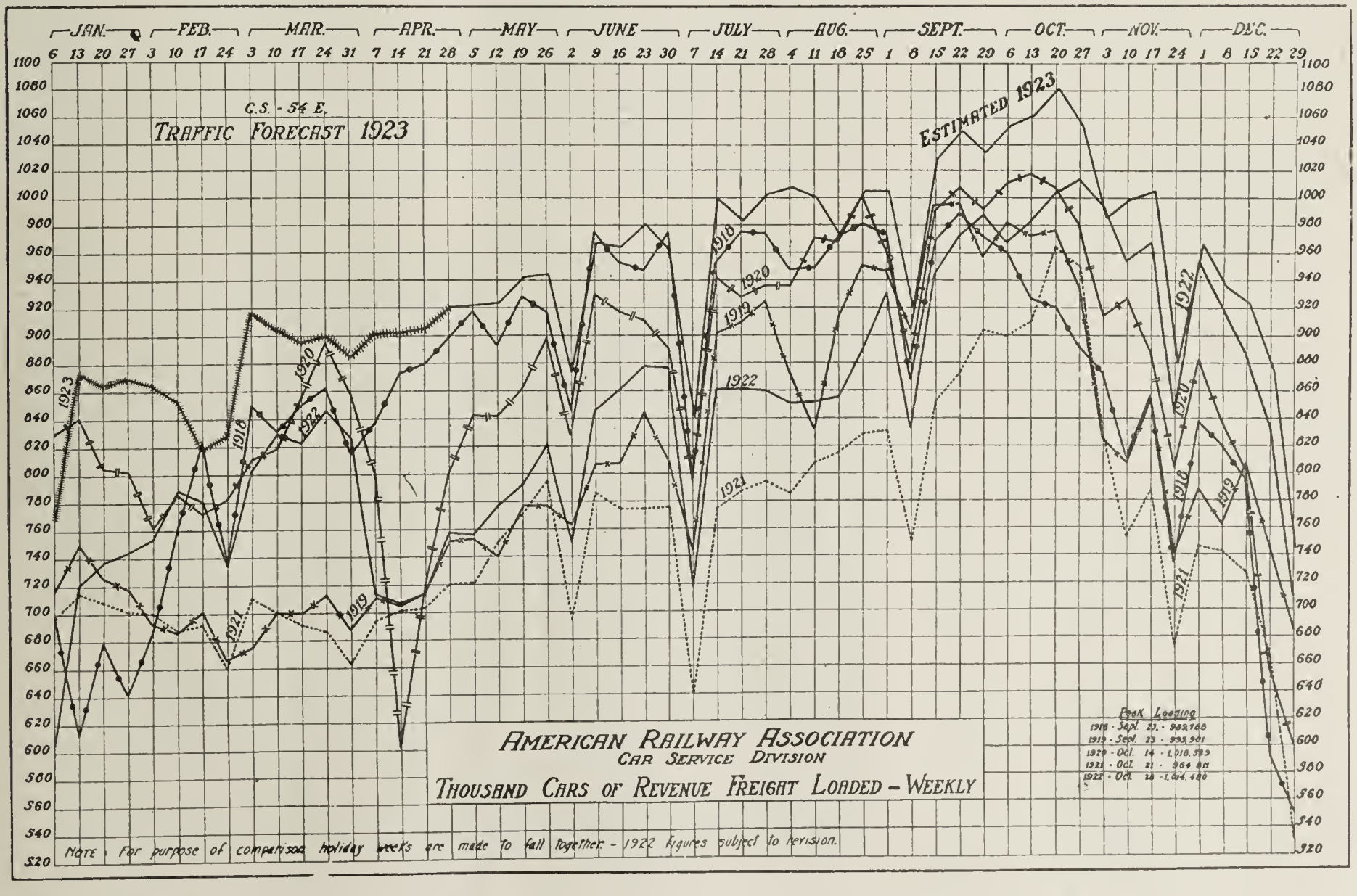
The following statement was authorized and the following resolutions adopted at a Member Meeting of the American Railway Association and were approved at a Member Meeting of the Association of Railway Executives. both meetings being held in New York City, April 5, 1923.

Despite the obstacles placed in the way of an efficient transportation service by the cumulative effect of the coal miners' strike beginning April 1, 1922, and the shopmen's strike, beginning July 1, 1922, the railroads, as shown by the report of the Car Service Division of the American Railway Association hereto appended, have, between July 1, 1922, and March 17, 1923,—a period of thirty-seven weeks —handled the greatest volume of traffic ever transported in the history of the country during any corresponding period of thirty-seven weeks.

The cars of revenue freight loaded thirty-seven weeks July 1st, 1922, to March 17th, 1923, as compared with the same period in previous years were: 1922, 32,939,789; 1921, 28,879,325; 1920, 31,312,945; 1919, 31,668,856 and 1918, 30,-819,593.

Anticipating a still larger development in agriculture and other departments of industry with the resulting increase in tonnage, and for the purpose of meeting the demands of commerce in an adequate and efficient manner, individual railroads, in the fourteen months from January 1st, 1922, to March 15th, 1923, have purchased an aggregate of 223,616 new freight cars, of which 117,280 have been delivered and put in service, and on March 15th, 106,336 were on contract for delivery during 1923; and in the same period, have also placed in service or purchased an aggregate of 4,219 new locomotives, of which 2,106 have been placed in service, and on March 15th, 2,113 were on contract for delivery during 1923. The numbers given, both as to new cars and new locomotives, are exclusive of subsequent orders which it is anticipated will be placed during the current year.

The significance and importance of these figures will be appreciated when it is remembered that the average number of new cars and new locomotives added over a period of ten years, 1913 to 1922 inclusive, has been 101,009 new cars per year, 1,960 new locomotives per year and that during the two years and two months of Federal Control there were purchased a total of 100,000 new cars or approximately 46,000 per year, 1,930 new locomotives or approximately 890 per year.


C.S. - 54 E.
TRAFFIC FORECAST 1923
ESTIMATED 1923
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1923
1918
1920
1919
1922
1921
AMERICAN RAILWAY ASSOCIATION
CAR SERVICE DIVISION
THOUSAND CARS OF REVENUE FREIGHT LOADED - WEEKLY
Peak Loading
1918 - Sept. 27. - 982,768
1919 - Sept. 27 - 993,901
1920 - Oct. 14 - 1,018,519
1921 - Oct. 21 - 964,611
1922 - Oct. 28 - 1,004,680
NOTE - For purpose of comparison holiday weeks are made to fall together - 1922 figures subject to revision.

This chart, issued by the American Railway Association, shows the thousands of cars of revenue freight loaded, weekly, from January, 1918, to March, 1923. The top curve shows the traffic forecast for the balance of 1923.

Indestructible shelter of precast slab construction on the Pennsylvania Railroad. The roof, as well as other portions of the shelter, is of reinforced concrete.

Aggregate carrying capacity of freight cars increased in the ten year period 1912 to 1921 inclusive, 22.9%; and aggregate tractive power locomotives increased during the same period 40.8%.

The railroads in full realization of the necessity for the greatest improvement and expansion possible of the country's transportation facilities to meet the growing demands of commerce, actually expended in the year 1922—

For cars	$200,000,000
For locomotives	45,000,000
For trackage and other facilities	195,000,000
Total	$440,000,000

and have authorized expenditures for equipment and other facilities of approximately $1,100,000,000 for the year 1923, divided as follows:

For cars	$ 515,000,000
For locomotives	160,000,000
For trackage and other facilities	425,000,000
Total	$1,100,000,000

The railroads of the country are raising this enormous amount of additional capital largely through borrowed money on the abiding faith in the fairness of the American people and reliance on the continuance of the policy announced in the Transportation Act, 1920, as a measuse of reasonable protection to invest in railroad property.

In order to bring about the most effective co-operation between the managements of the several carriers and to insure, to the highest degree practicable, adequate provision for the country's transportation requirements, a plan has been agreed upon which is set out in the following resolutions:—

Resolved, First: That the report of the Car Service Division reviewing transportation conditions and presented at this meeting be approved, and that, in order to further improve transportation conditions and to make the best practicable provision to meet transportation requirements as they develop, the following recommendations are adopted by the railroads as a definite policy and working program:

1. That by October 1, 1923, when the peak movement ordinarily begins, cars awaiting repairs be reduced to the normal basis of five per cent of the total equipment of the country.

2. That by October 1, 1923, locomotives awaiting heavy repairs be reduced to the normal basis for the entire country of fifteen per cent.

3. That to the extent coal is stored for railroad use complete the storage requirements by September 1st so that after that date the equipment and other transportation facilities may be used to the greatest extent for commercial coal necessities.

4. That the use of power and equipment for railroad construction and maintenance purposes be restricted to the minimum after September 1st in order that a maximum of power and equipment may be available for commercial purposes.

5. That railroads in producing and consuming sections impress upon all interested necessity for movement of coal and ore via the Lakes in the largest possible quantity early in the season. That railroads serving upper Lake ports on campaign for earlier purchase and shipment of coal from the upper lake docks to points of consumption.

6. That an effort be also made to bring about the prosecution of road and building construction work as early in the season as possible in order that equipment may be available for larger movement of seasonal commodities.

7. That all interested be impressed with the necessity for loading all cars to maximum capacity in an effort to bring the average loading to thirty tons per car for the entire country; for unloading cars promptly; increasing storage facilities where necessary and practicable and providing adequate siding capacity to facilitate loading and unloading, thereby increasing the number of available cars.

8. That every possible means be adopted to increase the mileage per car per day to an average of thirty for the entire country, particular attention being given to prompt movement through terminals and yards and to the issuance of embargoes when necessary to prevent congestion.

Co-operation of shippers and the public in the past has been most helpful in bringing about heavier loading, prompt unloading and increased mileage per car, and only by their continued co-operation and their full knowledge of what this means to their own transportation requirements can results be secured in these matters. It will be understood that each individual railroad will co-operate with its own shippers to this end and the car service division will take similar action with national and district associations to bring about the fullest measure of co-operative effort.

9. In the event of a car shortage, reports to the Car Service Division should be carefully reviewed by each railroad organization so that the report will more nearly indicate the actual car shortage measured by the ability to load daily, rather than a cumulative shortage which does not reflect the daily existing condition.

10. The railroads have already established and have in active and effective operation a comprehensive organization in the Car Service Division for the central control and distribution of freight cars which, during recent periods of car shortage, has under difficult conditions, secured to the public the best possible use of available freight equipment. The Car Service Division as a central agency, and through their District Managers, together with the District Shippers Committees, which have been and are being organized, will keep informed of traffic requirements with a view to the equitable and timely distribution and handling of equipment.

The railroads pledge themselves to renewed and effective compliance and co-operation with the directions of the Car Service Division, asserting the belief that, with the new equipment on order and the program for rapid conditioning of equipment requiring repairs, the freight equipment of the railroads will be handled and used in moving the commerce of the country to the best possible advantage.

The co-operation of the public with the railroads and their officers and employes generally is invited in order that by a better understanding and united effort transportation may be facilitated and the needs of the country more promptly and adequately provided for.

Resolved, Second: That individual roads give to the general public and to the patrons of their respective lines information as to their program, and also keep them currently advised of the progress made hereunder, including, so far as the individual line is concerned, information as to the progress made in its locomotive and car repairs and other improvements in transportation facilities.

The Anderson Foundry and Machinery Company of Anderson, Indiana is embarked on a building expansion program involving new structures which will increase the indoor space of the factory by 41,000 square feet and add 200 employes to the present force. This program which was recently announced by the company will make the plant one of the largest in Anderson, will bring the working force up to 500, and will involve the purchase of a good deal of new machinery to fully equip all of the departments.

Narrow type concrete crossing slabs in use on the Chicago, Burlington & Quincy Railroad in the suburbs of Chicago.

Grade Crossing a Wide Field for Concrete

Maintenance of Grade Crossing Expense Is Materially Reduced by the Increasing Use of this Material

The thousands of grade crossings, in both city and country, which the railroads are obliged to maintain, have offered a wide field for the employment of concrete. For this purpose several railroads have already made quite extended use of concrete deposited in place while numerous lines have developed or adopted one or more of the numerous types of precast slabs.

Public safety as well as a strong financial motive has compelled more attention to grade crossing maintenance of late and particularly since the enormous increase in automobile and motor truck traffic. Wooden planking, short lived and imperfect at best, has become so much more expensive in first cost and maintenance that as a natural consequence, many engineering minds have turned to concrete for a solution.

For city crossings, a great many of the better installations made to date have a solid concrete sub-base carrying the usual tie construction and a surfacing of concrete precast slabs or of solid concrete. On a number of roads crossings have been similarly constructed, with the exception that in place of full length ties short creosoted mounting blocks have been used, there being no need for the full ties where the gauge is rigidly maintained by concrete.

Preparing bed for concrete crossing slabs on Chicago & Northwestern Railway.

The frequent question of the feasibility of using rigid track support at the crossings with intervening resilient stretches has made some railroad engineers hesitant to adopt the permanent fixed subbase. However, since rigid support has been considered most frequently for installations in the larger towns where train speeds are limited, the question would seem to be pretty well settled by these limitations; but when it is considered that almost identical points of transition from the resilient to the rigid and vice versa occur at every bridge and large culvert on all first class railroad lines without operating limitations or noticeable maintenance, we may reasonably conclude that rigid crossing supports offer no noticeable operating difficulties.

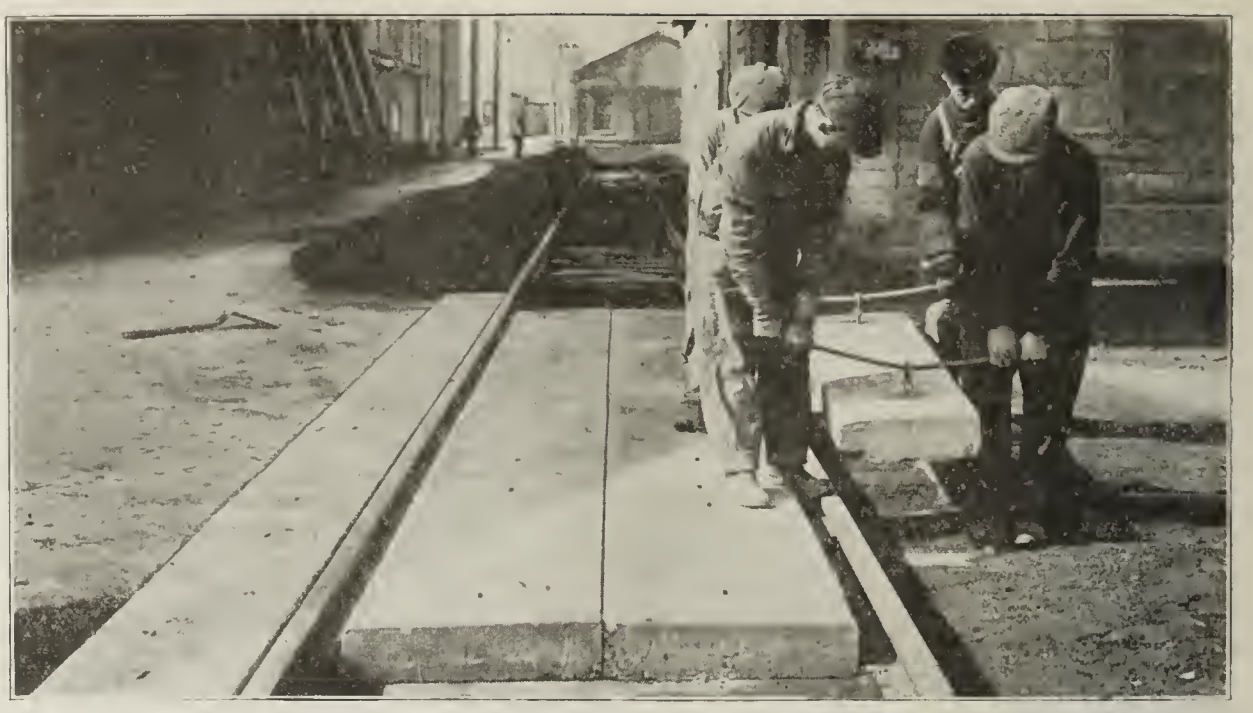
The Precast Slab

Precast or unit slabs for the surface have been preferred by many engineers because of the greater uniformity and general superiority of factory made concrete, the greater ease of installing under service conditions and of replacing in case of accidental breakage or destruction by ordinary wear. Where precast slabs are used it is easier to get at the track construction. Even where these arguments may not appeal strongly for town crossings, they are conceded as easily applying everywhere to country crossings, where the slabs may be and often are placed on ordinary ballast. In the latter circumstance, the entire installation is easily made by the regular section gang.

Precast crossing slabs have been used in quite a variety of shapes and sizes, in attempts to reach standard dimensions most generally applying to conditions to be met on each system. The limiting feature has been convenient weight, and this has limited the cubical dimensions. To every experienced maintenance engineer the advantages of keeping the slabs within weight easily handled by four men will be readily apparent.

Obviously, the thickness of precast crossing slabs is made equal to the height of the rail. The slabs will then lie directly on the top of the ties unless a concrete sub-base is provided. Frequently the slabs are anchored to the ties or small lugs cast on them to prevent creeping. The most popular slab width is equal to one-half the clear distance between rail flangeways for the slabs which are to lie between the two rails of each track. The slabs lying outside the rails are usually made somewhat narrower—fifteen inches to eighteen inches in width. In some cases the width of the slabs between rails has been made one-third the clear distance between flangeways, while in a few instances the width has been decreased to six or seven inches. Slab lengths are variable, keeping in mind permissible weights and crossing widths.

One of the accompanying illustrations indicates a desirable provision for convenient handling. A small casting containing a rectangular slot is imbedded in the slab on the longitudinal center line near each end, through which lifting irons are slipped and secured by means of bolts passed through underneath.



Placing concrete crossing slabs. Notice convenient method of handling.

Best Materials Should Be Used

Crossing slabs must be expected to encounter heavy duty and consequently should be made in accordance with the best concrete shop practice and of first class materials. Some of the most successful slabs have been made of mixtures as rich as 1:1½:2½ or 1:1½:3, employing clean, well graded sand and pebbles or stone of known high quality. The consistency to strive for is that which is just sufficiently quaky to take the form of the mold under light tamping. After truing carefully with a straight edge the surface should be given the desired coarse or slightly corrugated texture by the use of the wooden float.

The molds are carefully removed as soon as this may be attempted without injury to the slabs and the latter are immersed in a flooded area if convenient, or in some other way kept damp for ten days or longer if convenient. Sides of the molds should be absolutely straight and vertical, so that slabs will fit together as closely as possible. For this reason rigid metal forms are usually more satisfactory than those made of wood, although the latter material may be used, if with due care.

An excellent country highway installation.

A slab street crossing at Champaign, Ill.

Conventional Signs for Architectural Details

At the railway convention held in Chicago in March of this year, a committee on records and accounts submitted a long report on the feasibility of reporting engineering data in graphic form.

Through the courtesy of the *Railway Age*, we are enabled to present in this issue an illustration of the conventional signs for architectural details as submitted by the committee in this report for inclusion in the Manual of the American Railway Engineering Association. The report discussed the various forms of charts which could advantageously be used as well as engineering data which lend themselves to this form of representation. Recommendations were made as to the practical type of representation for each class of data.

The Railway Age states: "The committee issued a questionnaire to twelve architectural firms and twenty-three schools teaching architecture. The architects and schools were so chosen as to develop a national and international view of the need of compiling a list of symbols that later could be standardized or adopted as good practice. The replies to the questionnaire indicate a need for the adoption of a uniform list of architectural conventional signs. The committee redrew the 'List of Conventional Signs for Architectural Details,' submitted at the first convention for publication in the proceedings, attempting to group them into the various trades to which they apply.

"It has been found that such a list of symbols is needed and, if made available, will be of such use to the architectural departments of the railways as the topographical symbols, now published in the Manual, are of use to the many draftsmen in the engineering departments of the railways.

"It is not contended that the list as submitted is complete in itself, but that it is a collection of those symbols in most common use today, and that when accepted as good practice it will form a basis upon which revisions can be made, if found necessary. Again, by the adoption of the list as good practice it is readily seen that the tradesmen will become so familiar with them that only brief description of the kind and class of work would be required in the building specifications of any project."

MASONRY

STONE
STONE ELEVATION
ROCK FACED ASHLAR
RANDOM RUBBLE
DRY STONE OR RIP RAP
GRANITE
ARTIFICIAL STONE
BRICK & ROCK FACED STONE
ROUGH CAST ELEVATION
FIRE PLACE
CHIMNEY

BRICK
BRICK VENEER
TERRA COTTA
HOLLOW TILE
ENAMELLED BRICK
CONCRETE
CEMENT ELEVATION
ROUGH CAST
CINDERS
EARTH OR CLAY
ROCK

WOOD ROUGH
WOOD FINISHED
DOOR
SWING DOOR
HUNG WINDOW
FIXED WINDOW
SLIDING WINDOW

SLIDING DOOR
ROLLING DOOR
GATE
COUNTER LIFT
LIFT WINDOW
FOLDING PARTITION
ROLLING PARTITION

HEATING & PIPING

RADIATOR SQ.FT.
WALL REGISTER
FLOOR REGISTER
L.P. STEAM
RETURN
AIR

HOSE CONNECTION
FAUCET
HYDRANT
METER
WATER Hot or Cold H. or C. —H— —C—

SPRINKLER SYSTEM
GAS —I—I—
SEWER, SOIL, WASTE or VENT. S S W V
WYE CONNECTION
TEE, ELL & CROSS

STEEL IRON & METAL WORK

STEEL
WROT STEEL
MALLEABLE IRON
LEAD, BABBIT, COMP. METAL
CORRUGATED IRON

CAST IRON
WROT IRON
PIPE RAILING
GRATING
PASSENGER ELEVATOR

LATH & PLASTER
METAL LATH & PLASTER
ENAMELLED TILE
MARBLE
TERRAZZO
SUMP

GRAVEL
BROKEN STONE
CATCH BASIN C.B.
COAL CHUTE
MANHOLE M.H.
DAMP PROOFING

H.P. STEAM PIPE
EXPANSION JOINT
VALVE Kind by Initials. Gt = Gate G. = Globe etc.
TRAP Kind by Initials Ball = B Grease = G etc.
REDUCER

RISER
CUT OUT COCK
AIR STRAINER
FURNACE
BOILER

BRONZE
LEAD, BABBIT, COMP. METAL
CORRUGATED IRON

FREIGHT ELEVATOR
LADDER

MISCELLANEOUS

CENTRIFUGAL PUMP MULTI STAGE
FORGE

CARPENTRY

FRAME
SHEATHING

REVOLVING DOORS
SLIDING DOOR

PLUMBING

SINK
CLOSET Low or High Tank
LAVATORY

URINAL
L.T. H.T.
BATH
DRINKING FOUNTAIN

COLORS

AIR, STEAM AND WATER PIPES	BLUE INK	ELECTRIC WIRING	BROWN
SEWERS, SOIL, DRAINAGE & VENT	YELLOW	NEW WORK	RED ON B.Ps. RED WASH
ALTERATIONS & ADDITIONS OLD WORK	BLACK	OLD WORK TO BE REMOVED	YELLOW ON B.Ps. YELLOW WASH

Conventional signs for architectural detail.

Passenger Station of the Wabash Railroad at Mexico, Mo. This station has been in use several years and is in first class condition, without any expenditures whatever for repairs.

Concrete Block for Railway Stations

Some of the Advantages and Economies to Be Considered In Favor of this Modern Form of Construction

By A. J. R. Curtis

Railroad buildings, particularly stations, are subjected to unusually hard usage. Passengers, employes and patrons of one kind or another pass through during the greater part of the twenty-four hour day; heavy baggage, hand luggage, express, mail and often freight add to the wear and tear on station structure and platforms. Railroad stations are exposed to many varieties of accidental injury and the fire hazard is naturally great because of close proximity to locomotive sparks, the frequent dropping of lighted cigar and cigarette stubs, the accumulation of inflammable litter and spontaneous combustion of merchandise.

The public has a very abbreviated sense of responsibility toward railroad property and not only hoodlums, but persons who customarily show proper consideration for the belongings of others frequently exhibit peculiarly hostile tendencies toward railroad stations. The lion's cage gets no wear at all as compared with that to which passengers subject a busy station.

Under the circumstances, railroad stations should be designed and built for hard service, minimum maintenance and absolute resistiveness to fire. Concrete masonry construction meets requirements for the walls of stations admirably, and large quantities of concrete blocks already have been introduced for this purpose.

Concrete blocks of acceptable quality are manufactured at convenient locations along most railroad lines, but occasionally roads have adopted a policy of making their own concrete structural products, an entirely feasible undertaking if properly handled. These units are best manufactured in substantial factories usually located either at division construction headquarters or at points convenient to materials or to use. Portable concrete products plants for the manufacture of concrete block and concrete structural tile are always a possibility where large quantities of block are required at given points, but low transportation costs, as reckoned by the carriers, lead more often to the establishment of permanent plants at fixed points.

Some Requirements

Concrete blocks for railroad station work should have smooth, flat surfaces, unless to be covered by stucco. Rock faced, and other irregular block patterns

One of fifteen little stations of concrete block construction on the Detroit, Bay City & Western Railway, built by the Zagelmeyer Company of Bay City. The block are granite faced and very attractive.

are undesirable, for they collect dirt more easily and accidental contact with them is more likely to cause injury. For the same reasons stucco finishes, if used, should be smooth and free from sharp corners or projections. Particular attention should be given in the manufacture of the block to securing strong corners and hard, wear-resistive surfaces. Concrete must be of a strong, dense mixture, and the molds well tamped in the corners. The block must be cured in a moist, mild atmosphere for at least ten days or in a chamber of wet steam at 100° to 150° temperature for at least seventy-two hours. Careful curing is of utmost importance where it is necessary to secure especially strong surfaces and corners that will withstand constant hard usage.

No attempt will be made to specify an exact mixture of which such block should be made, since it has been found far more satisfactory to design mixtures suited to the particular aggregates available, taking into account the choice of process and type of equipment selected. Concrete masonry for buildings of this sort should be laid up in portland cement mortar mixed in the proportions of one part cement to three parts sand with

Granite faced Zagelmeyer block station at Gardendale, Mich.

the addition of a small amount of lime, if desired, as an aid to plasticity. Both ends of every block should be carefully butted with the mortar, as laid. The exterior joints should be carefully pointed and the interior joints trowelled flush, to make all joints absolutely watertight and workmanlike in appearance. If stucco is to be applied on the exterior, the mortar joints need not be pointed but may be trowelled flush.

The Saving Effected

The use of concrete block masonry makes possible a very considerable saving over the cost of laying up ordinary

An interurban shelter station at Evansville, Indiana.

brick work. Brick masons are actually laying in concrete block work more than twice the wall volume (per day) which they turn out with common brick. For example, it was recently found in the vicinity of Camden, New Jersey, that while a nineteen cent concrete block would replace forty cents worth of common brick in a wall, the introduction of the concrete units made eighteen cents worth of mason labor do the work of forty cents worth of labor necessitated where common bricks were used. Walls of low stations are constructed of blocks eight inches in width. This gives a finished wall thickness of about ten inches and is amply sufficient for one and two story buildings carrying ordinary loads.

In all but very mild, dry climates it is customary to apply furring and lath to one-piece concrete block walls in order to get the benefit of an additional insulating air space between wall and plaster. In railway station construction it is considered entirely satisfactory to plaster directly on the inner surface of the block, which affords a rigid base and offers both excellent mechanical bond and sufficient suction to hold the plaster firmly and permanently.

Appearance a Valuable Good Will Asset

Appearance of station buildings is a valuable asset in building up passenger business. A neat and generally attractive station makes for good will throughout the community and constitutes valuable advertising. To build a good station may be to mildly flatter a community; such a move is sure to be construed as an indication in the railroad's confidence in a bright and prosperous future for the town which gets the attractive new depot.

Although permanent construction on a railroad is almost sure to quickly cover any additional first cost with decreased maintenance, railroad managers still face the problem of improving the appearance of stations and making them more permanent without greatly increasing first cost. Concrete masonry units offer the solution because they cost less than other masonry units of comparable quality in the most cases, make possible a very considerable saving in the labor required to lay and, if the units are manufactured by the railroad an additional saving equivalent to a fair manufacturing profit may reasonably be expected. When standardization in station details is practiced consistently, additional savings may be expected by the use of standard units only, elimmating all special pieces and cutting.

Concrete block may be made economically in railroad construction centers where ordinary use justified a continuous output of 500 or more eight by eight by sixteen inch units per day. This output is approximately equal in cubical wall contents to 7,000 common brick per day or 175,000 brick per month. If smaller quantities are required with an econom-

The neat station of the D. B. C. & W. Railroad located at Watertown, Mich.

ical shipping radius they should be purchased locally. In fact, most of the blocks used for this purpose to date have been purchased from concrete products factories conveniently located on line.

Cement and Engineering News will gladly locate manufacturers in a position to furnish dependable wall material, on inquiry to the editor. Complete specifications for block and suggestions for manufacturing them will be furnished to railroad engineers, on request stating location and probable extent of proposed work.

Three sensible concrete driveways for railroad freight terminals.

Factory Made Concrete Units Are Economical

Some Applications of Precast Concrete in Railway Practice Show Saving in Time and Maintenance Costs

By E. C. Alexander

Railway engineers were among the first to adopt concrete construction generally on account of the severe service to which railway structures are subjected. There is no longer any serious doubt in the minds of railway men as to the best material for use when permanence and low maintenance cost are desired. The real problem before every railway engineer today is how to get the best design for his concrete structures and how to build them at the lowest possible cost commensurate with high quality.

Here is where the field for precast concrete products in railway construction comes in. No engineer would advocate precast units for all concrete structures on railways. Precast construction has its very definite sphere and is gradually finding new openings, but in each case a careful study must be made to determine which method of accomplishing the desired end is most economical.

It is scarcely necessary to repeat to the readers of CEMENT AND ENGINEERING NEWS the advantages of precast concrete construction. The fact that a large part of all railway structures are located at points remote from centers of population, however, gives unusual weight to the point that precast concrete eliminates the costly process of taking materials, equipment and skilled men out on the job. It is almost universally true—on account of the conditions under which railway work has to be done—that precast concrete structures are superior in quality to monolithic structures for similar locations. The matter of eliminating delays to traffic through the precasting of concrete structures is also very important to railway men.

About the only limits on the amount of precast concrete that railways will use are the number of structures for which it can be shown to be economical and the manufacturing facilities which are provided to make this product available to the roads. The company with which the writer is associated has made a specialty of this work for many years and has now in operation thirteen plants, located at strategic points for serving almost every railroad in the United States and Canada. This greatly increases the use of precast concrete by the roads since they are much more likely to buy material which can be shipped entirely or largely over their own rails. These plants are operated by an organization of specialists, and the workmen naturally become highly skilled in the standardized processes which can be repeated day after day with the same regularity as in any other manufacturing plant. Only the best of materials are allowed to enter into the products. Testing laboratories are employed to check the quality both of the cement and aggregates and of the finished product. The supervision and inspection are of course maintained to the highest standard, as the reputation of the company as a specialist in this field depends on maintaining the enviable standard of uniform quality that has been set.

A pre-cast concrete pipe used as a cattle pass beneath the railroad tracks.

Showing method of use and placement of pre-cast concrete pile.

Concrete Culverts

From the standpoint of importance, the concrete culvert probably leads all other precast products. The reinforced concrete pipe manufactured by this company was designed by an experienced railway engineer, a pioneer in the use of concrete, who understood the requirements of the railway culvert and the value of reinforced concrete as an economical substitute for cast iron.

This pipe is known as Class "B." It has made rapid advances in the favor of railroad officers since its introduction in 1906 and at present it is in general use on most of the prominent railways of the country. The pipe is oval in cross section, consisting of two semicircles connected at the horizontal diameter by tangents equal in length to the thickness of the pipe. All the steel lies in the region of tension, thus giving maximum strength with the minimum amount of reinforcement. The accurate placing of the reinforcement as designed is automatically taken care of by use of a circular reinforcing cage with the oval pipe. The oval shape of this pipe provides an excess of water area over round pipe, the flow being unrestricted until the water rises well above the horizontal axis.

This pipe is distinctly a railway culvert pipe and can safely be relied on for that purpose, as it can be easily identified from the many makes of sewer and drain pipe which are always circular. This pipe is made with bell and spigot ends, producing the necessary strength and stiffness at the joints to hold a culvert to grade.

The pipe is stenciled to indicate top and bottom in order to insure the placing of the pipe with the long diameter vertical. It is easy to inspect this pipe since it has greater head room than the circular and on account of its shape it is possible to see at a glance whether it is properly installed.

Concrete Piling Economical

Precast concrete piles are proving their economy and adaptability in an ever-widening field. Of the many possible types of foundations, concrete piles are one of the surest and most nearly fool-proof, which accounts largely for

the frequent adoption of this form of construction for such work as railroad trestles, bridge footings, and other structures where permanence, high

Pre-cast battery wells are easily handled. A Santa Fe installation.

bearing power, and exceptional safety are among the requisites.

There is perhaps no other precast unit in which greater care is necessary in manufacture than in a concrete pile. It is not only subject to handling stresses, but must also resist the impact of the driving hammer as well. However, when reasonable care is taken and a uniformly high strength concrete secured, the question of handling precast concrete piles is not a difficult one.

The Massey octagonal piles are cast horizontally, on wooden pallets, the width of one face. Two steel side forms, each supporting three side faces are clamped to the pallet, the top face being left open for filling and troweling the concrete. The reinforcement consists of eight longitudinal bars securely fastened to welded steel hoops. In the case of longer piles, additional shorter bars are provided in the center section.

The latest development in concrete piling manufacture is the use of the centrifugal process, which has proved so successful for the production of concrete poles in longer lengths in recent years. The fact that such piles are hollow possesses the added advantage that where jetting must be resorted to, the hollow center forms a jet pipe, requiring only a connection at the top. The fact that the jet opening is centrally located in the pile tip produces a uniform backwash on all sides, and insures straight driving.

These hollowspun piles, as they are called, have been driven both by the jetting process and with a driving hammer. The experiments have been so successful that there seems no doubt that this form of construction will take its place among the recognized foundation standards.

Battery Wells Made of Concrete

Precast concrete battery wells were developed a number of years ago to house the signal battery underground, and about the only changes in practice since that time have been in the refinement of certain details of construction and the gradual perfection of manufacturing and distributing facilities. Trouble with battery chutes for track circuit battery early led to the use of shallow, square concrete boxes, but the problem of producing such boxes at a cost and of a quality suitable for this purpose limited the application of concrete in this field. The Massey Concrete Products Corp. solved this problem with the design of three, six and ten cell round concrete boxes, made under modern factory conditions. The most recent development in the use of precast concrete in the signal field is the signal cellar, a combined battery well and signal foundation. It has a number of distinct advantages including the following:

1. Cheaper and simpler to transport than separate battery housing and foundation. 2. Less expensive to install, since only one hole has to be dug. 3. Easier to move in the event of a change in signal location. 4. Eliminates the short trunking connections and permits shorter and more direct wiring. 5. Presents a neater appearance and occupies less space on the right-of-way. 6. Provides a greater space for the batteryman than in any other shelter.

Concrete Cribbing Growing in Favor

Another precast product that has gained considerable popularity recently is concrete cribbing. It was originally developed for track elevation work in cities and extensively used on the Chicago, Rock Island & Pacific railway. It has since been adapted to numerous miscellaneous uses where solid retaining walls would have been prohibitively ex-

Hollow spun concrete pole used to support bridge "Ticklers."

pensive or where the other advantages of cribbing were particularly forceful.

In addition to the economy of this form of construction, it has a number of other advantages over solid walls. Cribbing can be easily removed for the construction of industry tracks, and the units salvaged for use elsewhere. The fill behind a crib wall drains freely while there is very frequently dainage trouble with solid walls due to moisture collecting behind the wall and freezing.

The hollowspun method of casting piles and poles referred to above, has been used in the production of telegraph and transmission poles for railways. Such poles have also been used for supporting bridge "ticklers" in cases of track depression work in cities, and also for station platform lighting. The unusual strength and uniformity of the poles made by this process promise well for the future of this product in railway work as well as in the other fields where it is already in general use.

Concrete cribbing on C. R. I. & P. Railway.

Method of installing pre-cast concrete pipe.

What Does It Cost to Mix Concrete?

By Leslie H. Allen

It is very difficult to estimate closely the cost of tools, plant and supplies requried for a large construction job. This will vary a good deal according to the size of the work. The tools and plant that are used for mixing and placing the concrete are properly a part of the cost of the concrete and should not be ignored when estimates on the construction are being made. It is very rarely that this item is estimated high enough, one of the most common sources of loss on a job being the excessive cost of tools and supplies needed to keep the job running. Picks, hammers and shovels are lost, stolen or worn out. Wheelbarrows do not last long under strenuous service conditions. Mixers require frequent repairs. Freight on two or three carloads has to be paid to and from the job. The labor of erecting mixer, tower and chutes is an expensive item and the constant adjustment and maintenance they require should always appear in the estimated cost of the concrete work. Rope, buckets, oil and miscellaneous items run into large figures, while power or fuel is another big item that often runs higher than expected.

The difference between the cost of plant required for a job of 3,000 yards of concrete and a job containing 6,000 yards is found in actual practice to vary quite closely in proportion to the yardage, and therefore, modern contractors are dividing the total cost of plant, tools and supplies by the yardage of concrete in order to get a unit figure to use in estimating their concrete price on jobs they bid on.

Take for example a building containing 6,000 cubic yards of concrete; the cost of plant, etc., will run about as follows:

Building mixing platform and hoisting tower, unloading and setting up mixers, engines, hoist platforms and bins, etc., would cost about $2,500. Depreciation and repairs on mixers and other machinery would be about $2,000. (Some contractors figure a daily rental on such items to cover this cost.) Loss or depreciation of shovels, rope, wheelbarrows, pails, picks and other small tools, etc., will be about $1,500. The best way is to charge to the job costs the actual value of all used tools and supplies of this character sent to the job and the cost price of all new ones purchased, and then to credit the job with the depreciated value of the items shipped back when the building is completed. Freight on three carloads to and two carloads from the job $250; power expense, whether electric or coal is used $1,000; temporary buildings such as cement shed, tool house, shanties, etc., about $1,250.

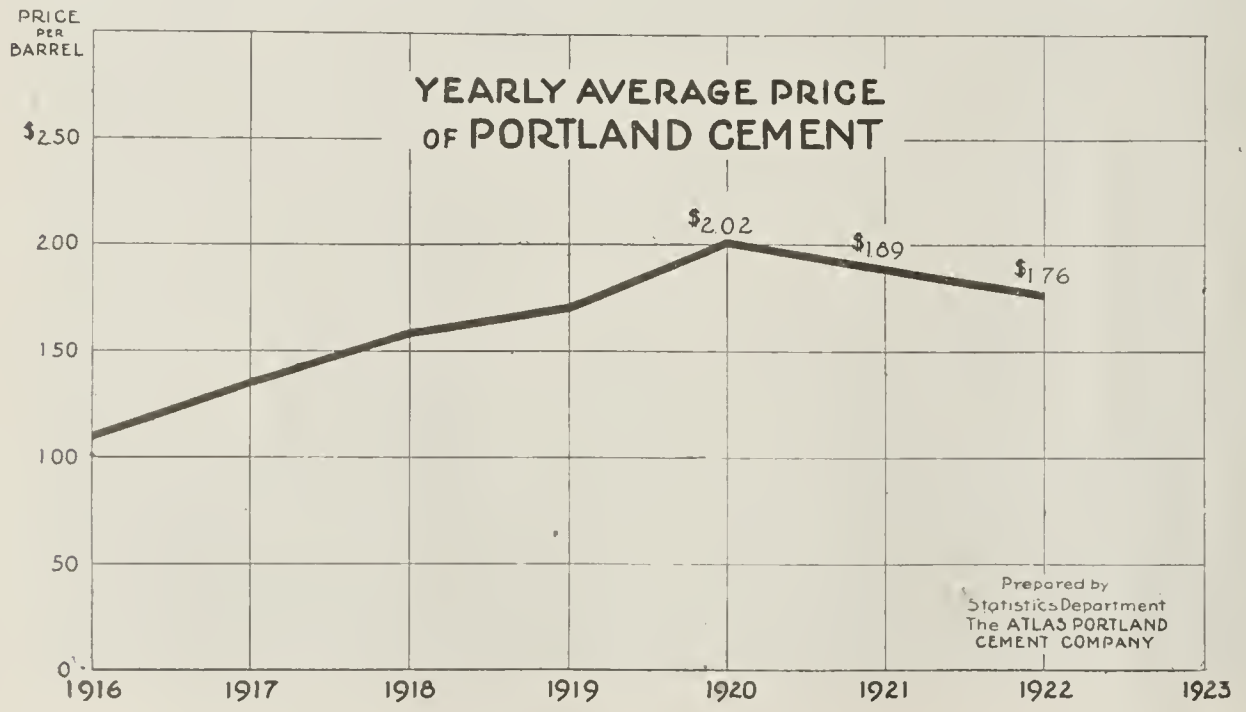
This gives a total of $8,500, equal to $1.42 per cubic yard on the cost of the concrete. Jobs below 3,000 cubic yards may run up to $2.00 per cubic yard and jobs higher than 8,000 yards may run as low as $1.20. For although the first and last items remain fairly constant, the others vary almost in direct ratio with the yardage. This is seldom realized by contractors who do not keep accurate cost records.

The contractor is advised to keep careful track of these outgoings and compare them with his yardage in this way. It may prove the means of stopping an unsuspected leak in his profits.

The Average Price of Portland Cement

The average factory price per barrel in bulk for Portland cement at the mills for the whole United States in 1922, according to figures received up to date by the United States Geological Survey, is approximately $1.76. This figure is probably subject to a slight change, as one or two plants have not yet made a report.

The accompanying chart prepared by the statistics department of The Atlas Portland Cement Company, shows the yearly average price per barrel of Portland cement from 1916 to date. This is the net average price, (exclusive of the cost of bags) received by all producers for the whole United States. According to the chart, the peak price reached in 1920 was $2.02 as compared to the price in 1922 of $1.76 per barrel. This shows a decline of twenty-six cents per barrel, or 12.8 per cent. It will be noted that the present price compares very favorably with those of the pre-war period, even with this tremendous demand due to greatly increased building activity.



Joins Waller Crow, Inc.

A. W. Catlin is now associated with Waller Crow, Incorporated in an executive capacity and with the title of vice-president. He is a graduate of the College of Montana in the class of 1897 and from that time was the consulting engineer for various large organizations. From 1906 to 1916 he was assistant to the general European manager for Faxer and Chalmers, Ltd., of London, which concern later disposed of its interests to the General Electric Company, Ltd. of England. Mr. Catlin's experience comprises

A. W. Catlin.

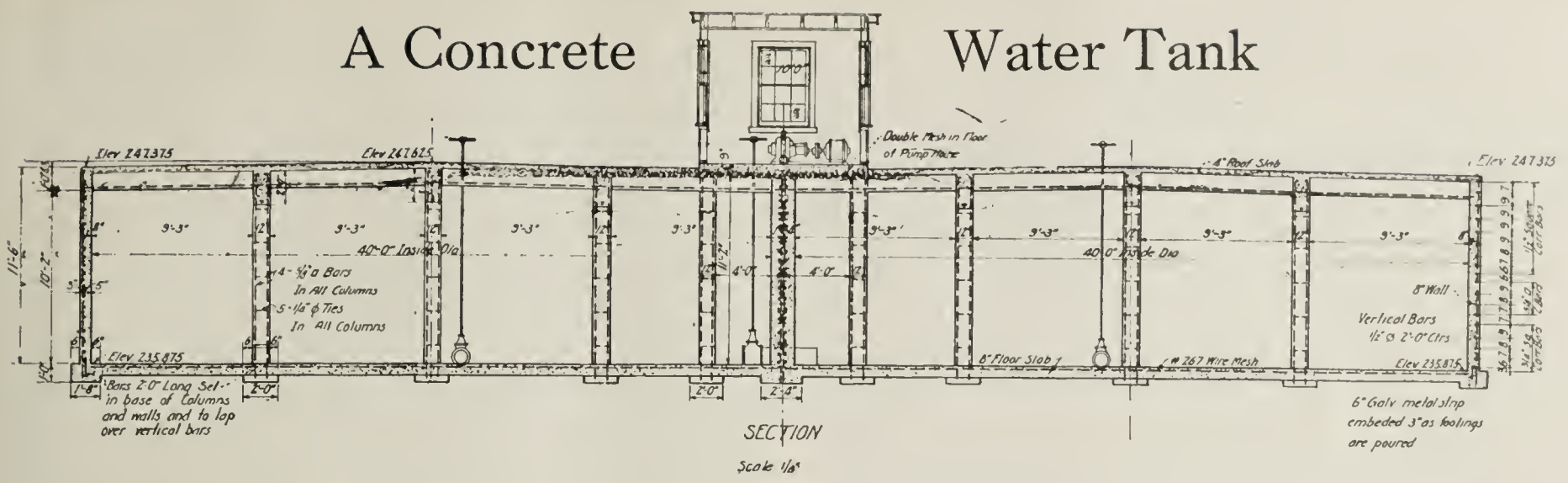
mining, metallurgy, combustion, mechanical and electrical engineering including special plant designs in these branches. He has many successful plants to his credit in various foreign countries. He redesigned the plant of the Cia. General de Asfaltos y Portland "Ashland", Cement Plant, Barcelona, Spain and supervised the construction and remodeling of many large industrial plants in Europe as well as in the United States. Among them the Ebro Irrigation and Power Company, Cement Plant, Spain; Aberthaw and Rhoose Portland Cement Co., Ltd., Stone Crushing Plant at Cardiff, Wales; French Government Naval Basins; Stone crushing plant, Toulon, France; Tscheliabinsk Gold Mining Co., gold milling plant employing the cyanide process, Tscheliabinsk, Russia.

He is a linguist of rare attainments and is a member of many notable European clubs including the New English Club, Petrograd, Russia; and the Mining and Metallurigical Club of London, England.

While Mr. Catlin's experience has been international his operations in the States and his examinations of phosphate, cement, coal, clay and other properties in the United States have been numerous and have covered a wide range.

The Chain Belt Company of Milwaukee, Wis. has issued its catalogue No. 125 showing the modern development of the paver manufactured by the company. This catalogue is exceedingly well printed and illustrated in such a manner that the seemingly complex arrangements of the well known Rex Paver are made very clear through the use of phantom illustrations. The text has been prepared so that almost any layman can understand the workings of the paver as no expense has been spared in clearly detailing each operation.. A copy of this catalogue may be secured by application to the company.

A Concrete Water Tank

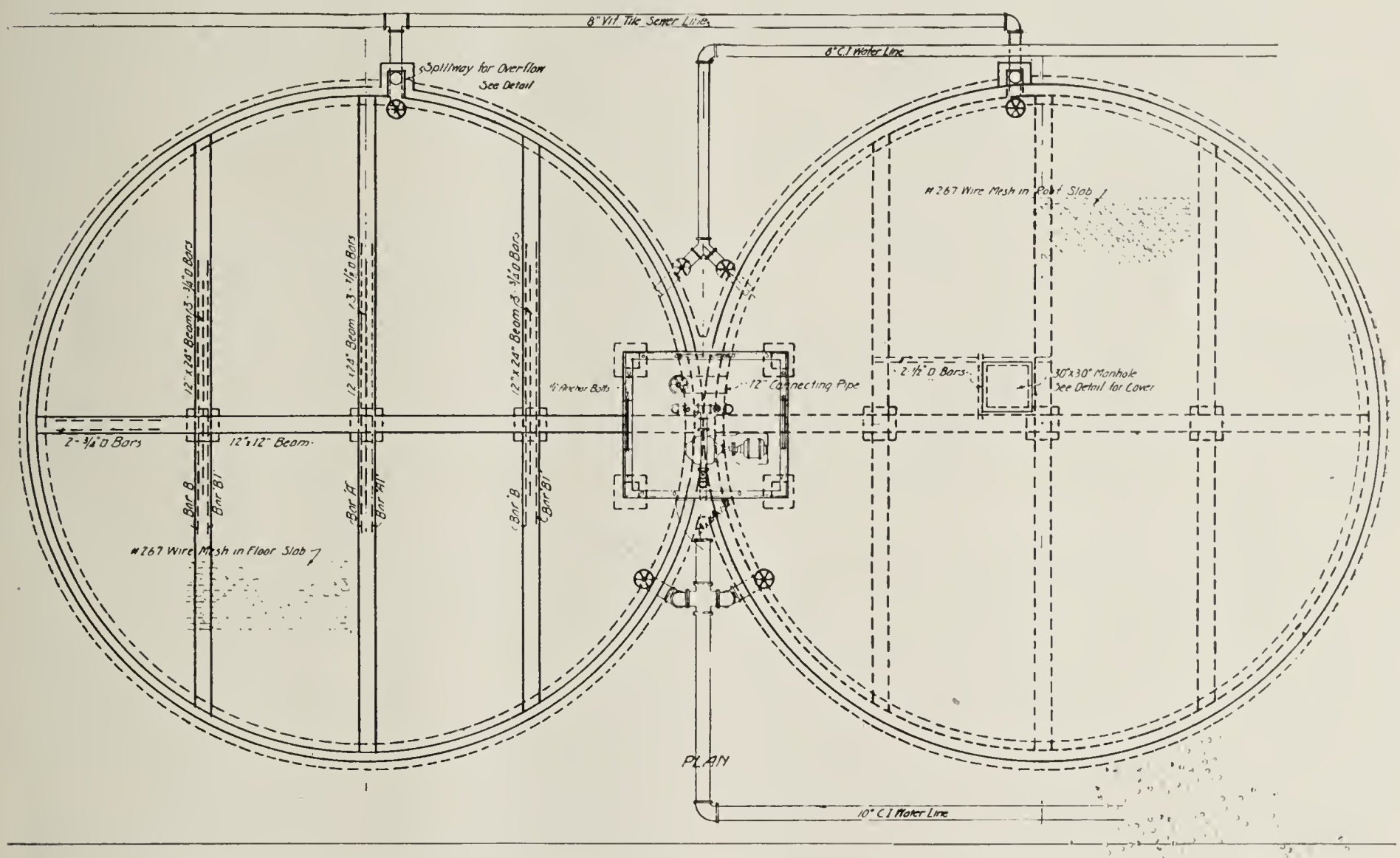

Elev 247.375
Elev 247.625
Double Mesh in Floor of Pump House
4" Roof Slab
Elev 247.375
40'-0" Inside Dia
4-⅝"ø Bars In All Columns
5-⅛"ø Ties In All Columns
8" Wall Vertical Bars ½"ø 2'-0" Ctrs
Elev 235.875
8" Floor Slab
#267 Wire Mesh
Elev 235.875
Bars 2'-0" Long Set in base of Columns and walls and to lap over vertical bars
6" Galv metal strip embeded 3" as footings are poured
SECTION
Scale 1/8"

Through the courtesy of C. S. Heritage, Bridge Engineer of the Kansas City Southern Railway Company, we are enabled to show the plans of a very interesting concrete tank installation erected by the railway company at Shreveport, La.

These tanks are used for storage reservoirs and are about 200,000 gallons in capacity. The reservoir is built in two parts to facilitate repairs and cleaning. The work was finished substantially as shown in the drawing with the exception that a small coping was added around the top for the sake of appearance. In preparing the mix for this tank installation hydrated lime to the extent of five per cent of the weight of cement was used.

The pipes projecting through the walls of the reservoir are not coated but were carefully cleaned before placing.

The top of the tank projects about two feet above ground level. The finish is smooth and the tanks are tight. The plan will give sufficient detail of the other features of the construction.



March Building Activity

Residential construction contracts awarded in March were greater than in any previous month on record, according to F. W. Dodge Corporation. Total residential contracts last month in the thirty-six eastern States of the country (including about seven-eighths of the country's total construction volume) amounted to $175,705,000. This figure brought residential construction started during the first quarter of the year up to $412,285,000. This class of construction has proceeded thus far at a rate of forty-four per cent ahead of the rate of the early months of 1922.

Construction contracts let in March for all classes of construction in these thirty-six states amounted to $371,447,000. The increase over February was thirty-two per cent. In twenty-seven of these states the increase over March, 1922, was fourteen per cent.

Residential construction in March represented forty-seven per cent of the total construction started during the month. Other important items in the March record were: $51,233,000, or fourteen per cent, for business buildings; $48,192,000, or thirteen per cent for public works and utilities; $41,903,000, or eleven per cent for industrial buildings; and $26,966,000, or seven per cent, for educational buildings.

The total volume of construction started in the first quarter of this year has amounted to $895,325,000. This indicates a rate of activity twenty-three per cent greater than the rate for the first quarter of 1922. Residential construction has amounted to forty-six per cent of all construction thus far this year. In total construction as in residential construction, 1923 to date has broken all previous records.

Contemplated new work reported from January 1 to April 1, has amounted to $2,291,104,000, compared with $895,325,000 for contracts awarded in the same period.

In Chicago the building permits for March showed that the building activity is maintaining the fast pace set by the first two months of 1923. The total was $30,571,447 as against $19,533,900 for March, 1922. A better idea of the immensity of the Chicago building boom is shown by the totals for the first three months of 1923—$76,693,447. This is within $2,000,000 of the total of all permits for the entire year of 1921 and about $36,000,000 more than the permits for January, February and March, 1922.

CEMENT and ENGINEERING NEWS

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The Coal Supply

We reproduce in part an editorial appearing in *The Black Diamond*, the coal trade's leading journal, wherein is sounded a note of warning that would be well to take into consideration before the conditions mentioned take place. The editor after pointing out the sluggishness in the present demand for coal and recalling that at this time of the year there is always a slump in the demand, goes on to say:

"Railroad authorities inform us that right now the roads are loading and hauling ninety-three per cent of their ultimate loading capacity. And it is now only a few days past the middle of April—the time that in every normal year represents the low point in rail burdens throughout the country. No crops are moving, coal has not yet started in quantity to the lakes, summer construction is not yet under full way, no unusual freight movements are going forward, and yet railroad loadings are within seven per cent of the theoretical ultimate capacity.

"And cars are short in all coal fields! Now, when coal demand is at a minimum it is not possible for mines to get all the cars they need. From all fields the word is the same; no cars, no cars, no cars. Road officials are reporting congested terminals and cars en route are taking from twenty to three hundred per cent longer time than should be required to traverse a given route. To the discerning individual, this condition of a slack coal market and an overburdened rail system, speaks plainly.

"The language should need no interpretation. If cars are not sufficient now, what is going to be the condition next fall and winter? If, when the demand is at an absolute minimum, mines cannot get all the cars they want, how plentiful will transportation facilities be when crops are moving, snow is flying, and everyone starts buying coal? Another shortage of cars, and thereby of coal, would seem inevitable. The message of the present condition, to our way of thinking, is to buy coal when it is available. It cannot conceivably get much cheaper or more plentiful, and it is decidedly possible that it will be much higher in price and harder to get as the coal year progresses."

Why Is a Contract?

The leading article in this issue is a resume of conditions which have to do with the supply of cement which is going to be available to industry in general during the construction season of 1923, which is even now bursting on us in full bloom. This study is the result of exhaustive inquiry and earnest study of all controlling factors. The net verdict is that there is going to be an ample supply available for all needs, regardless of how great they may be, *providing* cement dealers and consumers order accurately, early and honestly. The real meaning of this phrasing, while not brought out in the article in words of one syllable, is plain—a contract must be a contract in cement exactly as it is in any other commodity.

The most serious circumstance that can occur to any manufacturer is to have the bottom fall out of his business by means of having orders, on which he had confidently relied, cancelled without warning. It does more than destroy his plans for that year's business—it ruins his faith in his fellow man and is prone to cause him to be inclined to step aside from the path of strict business ethics when such a course would seem to be to his temporary advantage.

At present the only glaring contract abrogations in the cement industry are those occasioned by foolish buying; the practice of ordering full supplies from each of two or more suppliers in an attempt to be certain of an adequate supply. Such practice is not only indefensible from the standpoint of personal honesty, but is the root of severe troubles in the industry. The practice, if widespread, would cause production to prepare a total volume of finished product far in excess of the nation's requirements and to go through the season with an unbearable burden of carry-over, both physical and financial.

What is a contract, anyway? According to a popular dictionary, it is a mutual agreement whereby two or more parties agree to perform certain acts for the mutual benefit of all concerned. It is a solemn moral obligation on the maker to carry out the terms of his promise. There is no difference, morally and ethically, between a broken contract and an outlawed note. Each is the signed bond of the maker to carry out certain obligations and the dodger of contract obligations is no better than the evader of the terms of a note.

And why is a contract? The only excuse for its existence is that the various parties thereto may have some concrete basis upon which to predicate the conduct of their business. Working under contracts, the builder may go ahead with his engagements of labor and finance and intelligently plan constructive work; the manufacturer may lay and plan and direct operations with some knowledge of what the future has in store. Without contracts, the game of business would be no better than a common faro lay-out, as the element of chance would predominate.

He who wilfully enters into a contract, knowing that he will be unable to carry out its provisions, or planning to evade its requirements by "cancellation", is cheating himself and the business world. A contract can not be "cancelled" except by mutual consent—it can only be broken. And the contract breaker is no better than any of the less refined kinds of crooked business men. He should be treated as such.

Shall the State Operate Cement Plants?

Ever since the war has had its effect upon the political thought of the world there has been a growing tendency in the United States for governments to take over functions which previously had been left to private enterprise. That such should be the tendency is logical enough—power begets a thirst for power, and it was necessary that extraordinary controls be delegated to the government during the war in order that co-ordination of effort might result in defeat of the national enemy.

To control industry, whether it be railroads, coal, cement or whatnot, is to increase power and prestige, to give the politician a place in the sun that feeds his vanity and sense of importance. And politicians, parade though they may as statesmen, are human, and will grab what they can from the body politic.

After all, what the public is interested in is not only effective production of the necessities of life, but also effective operation of government. The question of whether governmental operation of private industries is to be desired or not rests not so much with the rights of the individual, private industries, as with the effect such government operation may have upon the common weal. If governmental control of industry, carried over into governmental operation, results in greater efficiency, cheaper products, ample supply, then surely governmental operation is to be desired, regardless of the damages to the private capital invested. If the reverse is shown to be true—that governmental operation results in greater inefficiency, higher cost products, and shortages that never exist under private production, then the voice of the public will eventually be heard above the hue and cry of the political pack, and private operation of all industries will become the order of the day.

Before attempting to discuss in detail the present tendency of state governments to operate cement plants, let us consider for a moment the economic functions of government. Some one has wisely said that that nation is blessed which is least governed. John Stuart Mill, an economist the soundness of whose principles is becoming more and more apparent as age is added to them, is father of the statement: "The function of government is to do for the individual those things which the individual cannot better do for himself."

What are those things? It is obviously unsatisfactory for the individual to undertake to protect his person against the thief and the vagabond—such a program would entail the "toting" of guns by all of us. Hence the police power is rightly placed in the hands of society—the government—and the government rightly interferes with the individual when he attempts to usurp this governmental prerogative. Education is another function which is more effective when it is socialized—when the child in Portland, Oregon, is receiving the same fundamentals of education and ideals as the child in Portland, Me. Through such a process a common ideal of life is created which would never be born were education of the child left to the individual parents.

We could elaborate upon such functions, but the fact exists and is generally recognized that should the government, national, state, county and city, perform well these functions which it can better perform for the individual than he can for himself, it would have its hands full, without stepping over into private industry. Should it perform these functions adequately, the general conditions under which we live would be greatly improved, although the near-sighted politician may not see that in bringing these services closer to perfection he will gain that fame and recognition that his heart craves.

The advocate of governmental operation of industry —and certainly the phrase is not too broad, because if one industry is a fit one for such control, all industries must be catalogued beside it—may urge that with the wealth of the nation, both of dollars and of brains, behind industry through such operation the efficiency and economies that we wish could be brought about. He may concede without thought that the government can better operate the railroads or the mines than the men which private capital hires to operate them, therefore bringing private industry into the scope covered by Mill's pronouncement.

We can judge the future by the past, if by any one means. We have seen the government functioning in private business—in the ship building industry, in the coal industry, and, yes, in the cement industry—and those of us who have studied the results have real reason to doubt the wisdom of entrusting the economic welfare of the nation to the government.

Let us first consider the qualifications of the average statesman (polite for politician) to operate or control the operation of any large scale production of any commodity. Who are the men we send to the city hall, the state or national legislature? Are they men who have made a phenomenal success in business—men whose names are printed in red in "Who's Who"? Or are they ordinary men whose returns from private businesses, either as owners or employees, have never much exceeded what the state will pay for their services?

You know the answer to that question. You also know that as water seeks its level, so do the brains of men find their market value, and receive somewhere within a shooting distance of what they are actually worth. Can you conceive of a private corporation entrusting the problems of the conduct of their business to the average representative in Congress? Can you conceive of such an industry as the United States Steel Corporation dispensing with the services of Elbert H. Gary to turn his job over to one of our Congressmen? And yet the Congressman would accept the job at a far lower salary than that paid Mr. Gary.

Even if we should concede for the sake of argument that the brains in our legislature are of a caliber with those we find in private industry, it is still obvious that they have not had the specialized training that every important industry demands of its executives. They have generalized perforce—today they are studying railroads, tomorrow oil, the next day the tariff on pearl buttons! They have not the technical training or past experience to warrant employment in a single industry of large dimensions.

Nor have they, individually or collectively, while serving in the government, the time to devote to any one of the various industries that might come under their operation should the present tendency toward socialized industry obtain. Men in private business devote their life time to one industry—they would not think of undertaking in private life the management of twenty or thirty oddly assorted businesses. Why should we entrust such an industrial conglomeration to the collective management of a group of untrained political adventurers? Does it seem reasonable? Are we ready to entrust our economic wellbeing to a group of blind babes in the woods?

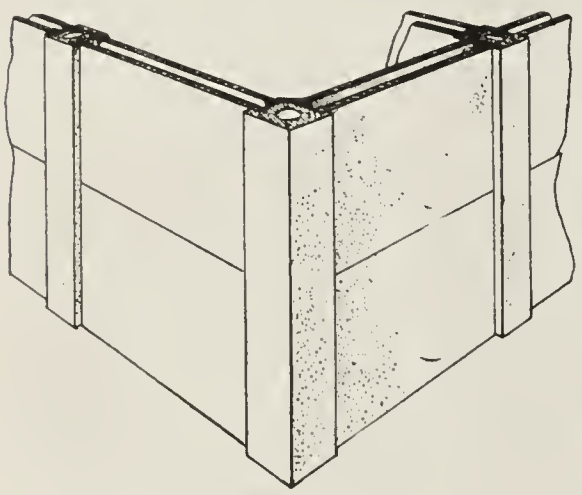
Editor's Note: This is a first of a series of editorials discussing the subject suggested in the heading above. Subsequent editorials will take up the question outlined in detail.

A five family building being built from pre-cast concrete slabs.

Portable Concrete Building Construction

An interesting development of pre-cast units is the portable concrete building which has established its practicability beyond question.

This type of concrete building is especially adapted for bachelor quarters and for families on the community house plan. The details are so arranged that comparatively small number of units may be combined in a variety of ways making them adaptable to all conditions. It is so simple that alterations in the sizes of rooms are easily and quickly made. The erection of these buildings requires no particular skill as these houses can be put together in an exceedingly short time.



Detail showing installation of the concrete slab panel and vertical posts.

The construction consists of reinforced, pre-cast units light enough to be easily carried and formed to permit the various elements to be rigidly locked together thus providing a weather-proof building. At the same time they permit of rapid erection and economy in moving and rebuilding is possible. With ordinary care no loss occurs in the re-erection of the units.

These units are standardized and are easily handled, a greater number are light enough to be maneuvered by two men. As a general thing this mode of construction forms a building with walls made up of vertical posts, spaced three feet six inches from center to center, with one inch thick concrete panels, two feet by three feet, set up in direct connection with these posts to form a hollow wall with a continuous air space of three inches from top to bottom of the wall, except for a distance of four inches at each post. Ordinary building walls are built with but six standard units.

The posts are cast with an integral batten on the outside surface, against which the one inch thick wall panels are placed vertically, one on another, to form the outside wall, after which parting strips, which serve to hold the slabs in place and form the three inch air space, are bolted on to the posts by means of holes through the posts or by nailing through small holes in the strips to wood inserts in the posts. The inner row of panels is then erected in a similar manner and held in place by one and one-half inch thick battens which are secured in place by means of bolts through the battens and metallic inserts which are cast in the post flush with the inner surface of the post. The wall plate is rigidly secured to the posts by means of bolts, the heads of which are held in metallic inserts cast in the post flush with the top surface. The lateral bracing of walls when required is taken care of by means of rectangular partition sections which are inserted within the partition wall and fitted to connect with any intermediate post.

As shown in the illustrations accompanying this article portable concrete buildings may be put to various uses. A detailed plan of the pre-cast units is also given. One of the interesting installations is a telephone booth made

A portable concrete telephone booth. This rests on concrete slab stringers.

of these units and which can be quickly and easily assembled being shipped to its point of use knocked down and thereby taking very little space in transit.

The building may be constructed with any length or width and divided into any combination of rooms, and if multiples of approximately three feet six inches as shown on the planning diagram are adhered to no special units are required. Windows, doors or other openings may be placed as desired. The illustrations show units for one story buildings, but the height of sidewalls may be varied by increasing the length and sections of the posts. The type of roof used may vary with the use of the building and its climatic location.

Reinforcement of Slabs

It would be natural to suppose that the most effective way of using steel for reinforcing concrete floors and other slabs would be to place it in the direction in which the stress was applied, and at right angles to the direction of probable cracks. Mathematical analysis of the problem confirms this assumption.

In the design of concrete ships, however, there were other considerations which made it seem desirable to place the steel diagonally with respect to the direction in which the cracks were expected. Accordingly tests were made at the Bureau of Standards on slabs in which different types of reinforcement were used. These tests confirm, in a general way, the correctness of the mathematical analysis and show that the reinforcement should be laid parallel with the span and not at an angle with it; unless there are other factors, such as shrinkage in setting or expansion and contraction with change in temperature, which tend to produce cracks at right angles to those due to load stress.

But shrinkage and expansion occur in all concrete structures and frequently transverse reinforcement is required. Cracks from such causes may be prevented by the use of bars laid at an angle with the span, or by mat reinforcement.

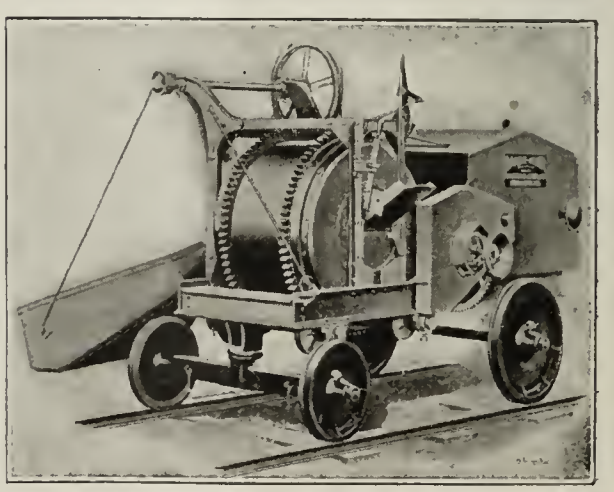
In these tests it was found that the use of reinforcement having diamond shaped meshes distributed the cracks effectively and kept them smaller than was the case with the other types of reinforcement tested. About a 12-inch lap where the ends of these sheets of expanded metal joined was found necessary to prevent slipping of these splices.

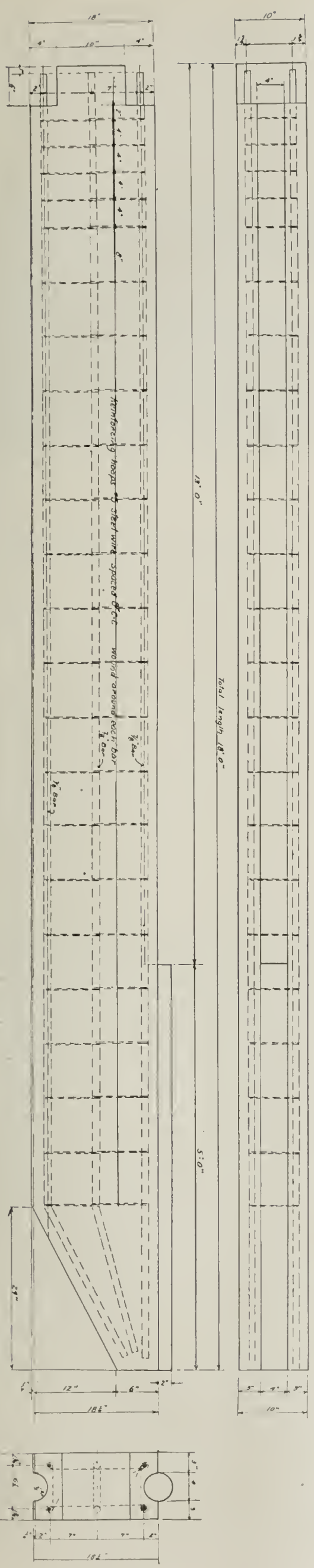
The early close of the war rendered it unnecessary to apply the results of these tests to concrete ships; but the information acquired is likely to be of value in the design of buildings.

The results of these tests are published in Technologic Paper No. 233 of the Bureau of Standards, entitled "Tests of Heavily Reinforced Concrete Slab Beams: Effect of Direction of Reinforcement on Strength and Deformation." Copies of this paper can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 15c.

For Odd Jobs

The Koehring Company of Milwaukee has recently put on the market a concrete mixer designed for right of way maintenance and odd jobs in railway construction. The machine is built in two sizes, four and seven cubic foot capacities. It can be drawn to the place of use by a gasoline motor car, taken from the track and used without the necessity of laying rails or special tracks. The mixer can be operated by either steam or gasoline and has one man control.





The concrete roof on these train sheds is two and one half inches thick. They are reinforced with quarter inch rods. .This work is now in progress.

Concrete Train Sheds in Galveston

The Gulf, Colorado & Santa Fe Railway is erecting some concrete train sheds at the Galveston, Texas, terminal, as shown in the accompanying illustrations.

The concrete roof on these train sheds is two and one-half inches thick and the specifications called for triangular mesh reinforcing No. 168. However, there was substituted one quarter inch rods spaced one foot longitudinally, three inches horizontally. The proportions of the concrete in the slab were 1-2-4. The reinforcement is as near as possible placed an inch from the bottom of the slab.

In the work at this station an interesting development was the use of concrete sheet piles which were salvaged from the Galveston Causeway, after being submerged in sea water for twelve years, and which were found to be in such good condition that they could be used for foundation purposes. These piles are eighteen feet long and have a cross section dimension of 10" x18¼". They are provided with tongue for a part of the length and groove. The reinforcement was of hoops of No. 5 steel wire spaced eight inches center to center horizontally, with six ⅞" bars vertically, spaced seven inches. These piles were driven in the causeway in 1910 and 1911 and were capped with concrete twenty-four inches wide and fourteen inches deep, cast in place. The accompanying diagram will show the construction of these concrete steel piles. These were placed slightly above mean low tide and at the top were subjected to the most severe conditions for developing failure, but as has been said, they were found in excellent condition when salvaged. In taking them from their place the concrete cap was blasted away and in some cases the piles were shattered which exposed the reinforcing. This, however, was found to be in perfect condition in every case.

The proportions of the concrete used in these sheet piles were 1-2-4 and the piles are an excellent example to controvert the theory that concrete construction cannot be made to withstand sea water. For that matter, the Galveston Causeway itself is an excellent example with the same feature. We are indebted to J. L. Starkie, Office Engineer of the Gulf, Colorado & Santa Fe Railway at Galveston, Texas, for these interesting illustrations.

Method employed in placing the concrete slab roofing on the train sheds.

A general view of the Gibraltar Cement Block Company's plant at Indianapolis, Ind., showing the power plant, washing and screening apparatus of gravel plant in the background.

A Modern Cement Block Plant With Ideals

A Description of a Plant, Its Methods, Ideals and the Personality Behind These. Merit Brings Success.

During the past few years there has been a tremendous expansion in the concrete industry. This growth has been marked by a constantly increasing demand for concrete building units. Everywhere, throughout the country, plants are being equipped with machinery capable of quantity production and the most efficient and economical methods of manufacture are replacing the tedious and wasteful labor of hand production. A most encouraging feature of this new development is the insistence upon a high standard of quality in the finished product.

Typical of the modern ideal in construction and operation is the plant of the Gibraltar Cement Block Co., Morris street and Eagle creek, Indianapolis, Ind Construction of this plant was begun early in July 1922, and on July 29, 1922 the first concrete blocks were produced. After production was well under way, steam curing chambers were constructed and other additions were made to the plant until now, in the spring of 1923, the factory is practically in its permanent form.

In the illustrations a general view of the plant is given showing the storage yard in the foreground, the manufacturing building at the right and the steam curing chambers at the left. The washing and screening plant of the sand and gravel company furnishing the aggregate used by the block plant is shown in the background.

View of the storage yard showing method of trucking the block to the building site.

Location of the Plant

The plant of the Gibraltar Cement Block Company is located on the property of the Eaton-Kaster Gravel Company. This company is a large producer of washed sand and gravel. Recovery of its material is made by a Sauerman dragline cableway outfit and several commercial grades of material are produced. As is the case with most producers of aggregate, a surplus amount of fine material is recovered by this company. At the inception of the Gibraltar Cement Block Company, a most equitable arrangement was entered into by J. G. Praed, proprietor of the block company, and the officials of the Eaton-Kaster Gravel Company. The agreement stipulates that the rental of the ground occupied by the block company and the aggregate used by it shall be paid for as a royalty on each block produced.

In this way the gravel company is able to dispose of its excess fine material, the block company is assured of a constant supply of clean, well graded aggregate and the rent is equitably based on the production of the factory. It would seem that similar arrangements between aggregate producers and concrete products manufacturers could be consummated in other localities with equal satisfaction to both parties.

The plant is in the southeast section of Indianapolis. This city has a population of about 320,000 and is one of the most rapidly growing cities in the middle west. Although from July 29, to December 7 last year, this plant produced and sold more than 40,000 concrete blocks, at no time was it possible to build up a stock. This spring there is unusual activity in the building line and existing plants are unable to meet the demand for their products.

This encouraging situation has been brought about largely by the enforcement of the city's building code, which authorizes frequent inspections of block producing plants and requires that manufacturers' products have a minimum compressive strength of eight hundred

pounds per square inch of gross cross sectional area. The enforcement of this ordinance has had a beneficial effect upon the business of the producers complying with its requirements. Blocks of inferior quality are disappearing from the market.

General Description of the Plant

The land available for the concrete block plant comprises about two and one-half acres. The manufacturing building is located just north of the sand and gravel company's washing and screening plant, and aggregate for the block plant passes by gravity through a chute to a point within thirty feet of this building. The main building is of frame construction and is fifty by forty-five feet. It is divided into two sections, the east section twenty by forty-five feet, and the west thirty by forty-five feet in size. The steam boiler and cement storage room are located in the east section. The cement storage room is sixteen by sixteen feet in area and has a capacity of two carloads, is accessible by motor truck, entrance being on the north side of the building and the driveway passing to the west of the boiler. The west section of the building with the exception of a corner ten by ten feet which has been partitioned off as an office, is devoted to the manufacture of the product. Steam curing chambers have been constructed on the west side of the factory building as shown in the accompanying sketch and photograph.

Handling Aggregate and Mixing

The aggregate, which is a sharp, coarse torpedo sand excellent in every respect for the manufacture of a quality block passes through a chute from the screening and washing plant and forms a large storage pile about thirty feet south of the factory. At present, material is loaded into a wheelbarrow and wheeled to the hopper at the foot of the bucket elevator. The installation of a belt conveyor for this purpose is contemplated.

The aggregate is dumped into a sheet steel hopper, sunk into a pit surrounded by monolithic concrete retaining walls. This hopper has a capacity of one cubic yard and was manufactured by the Universal Concrete Machinery Company of Peoria, Ill. It is equipped with a slid-

Link-Belt bucket elevator handling aggregate to the storage bin.

ing bottom agitated by an arm operating in conjunction with a Link-Belt bucket elevator. This elevator is operated by a two horse power Red Band electric motor located just inside the building. With this outfit one cubic yard of material is placed in the overhead hopper in eight minutes. The aggregate bin or hopper has a capacity of fifteen cubic yards so that the man supplying it, has frequent intervals during which he assists in the storage yard and elsewhere around the plant. Chutes from this overhead bin discharge directly over the two No. 2 Kent continuous mixers installed just inside the south wall of the plant.

The arrangement for mixing concrete is illustrated. In the foreground are the two Kent mixers each serving a Universal automatic block machine. In the background can be seen the cement storage room. Cement in bags is delivered to the plant by motor truck. Trucks backing through the boiler room unloading into the cement storage room. Universal portland cement is used for the body of the block, and Lehigh portland cement used for facing mixtures. Whenever possible, cement is purchased in paper bags. The empty sacks are piled on a platform at the side of the mixer.

The Mixture Used

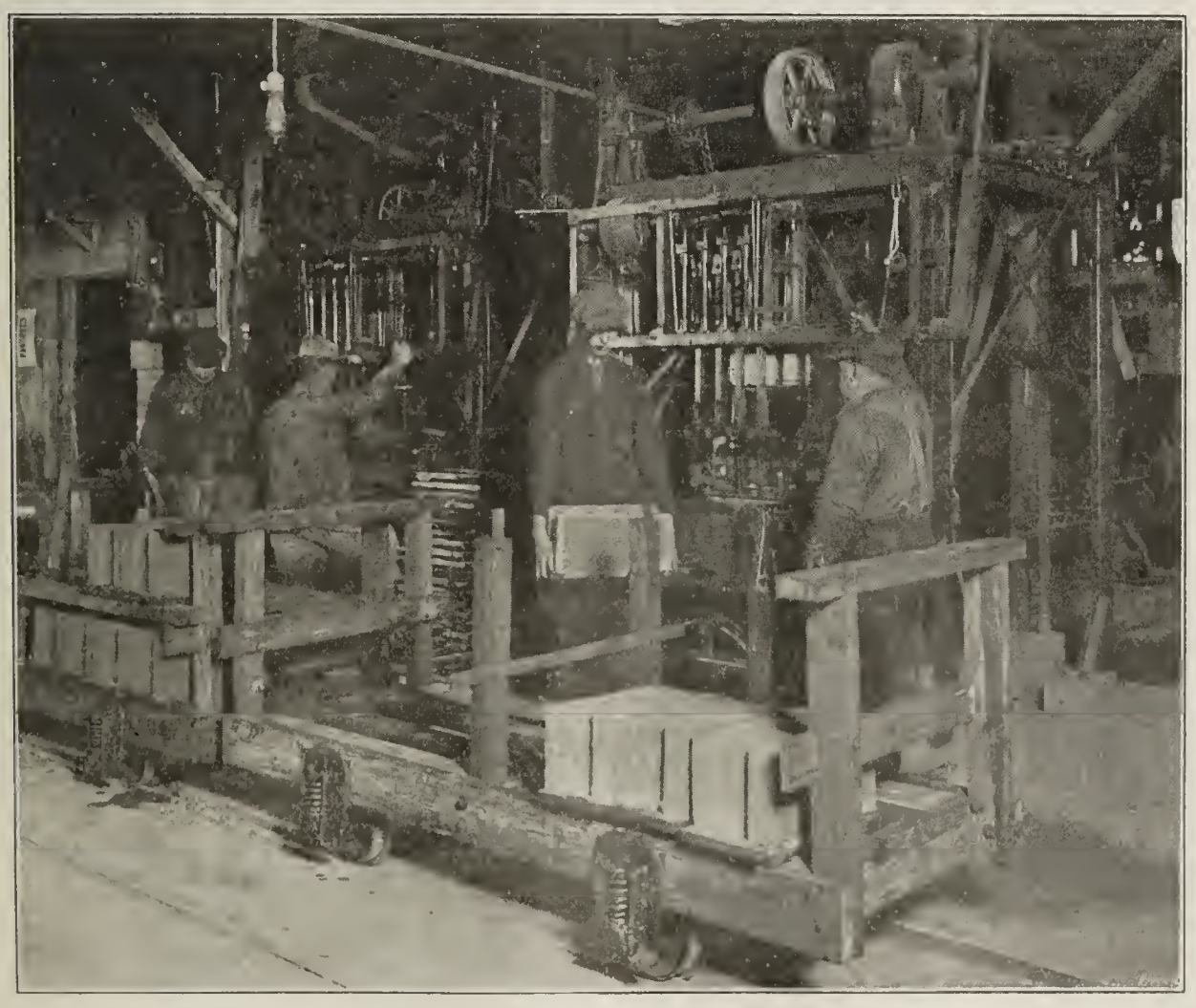
Concrete of wet consistency is used and it is thoroughly mixed by the Kent mixers. Finished blocks were carefully examined for any evidence of improper mixing, but none were found. Concrete is made up of one part portland cement to from six to seven parts of torpedo sand. Water is obtained from a well located in the southwest corner of the manufacturing building. It is pumped by a Duro pump operated by a one-eighth horse power electric motor into an eighty gallon tank from which it is distributed to the mixer, boiler and curing chambers as required.

Blocks are made on two Universal automatic block machines furnished by the Thomas W. Noble & Co., 35 S. Dearborn street, Chicago. The Kent mixers discharge directly upon the elevators with which these machines are equipped and concrete is elevated to a feeding hopper at the rear of the mold box. The operator places a wooden pallet on the front plate of the mold box, closes the box, throws a lever into gear and steps on a foot pedal.

The feeding device then comes out over the mold box, concrete enters and the tampers descend. An unusual feature of this machine is its tamping action. The entire weight of the tampers and the tamper carriage rests upon the concrete in the mold box. This weight is rapidly shifted from one tamper to another by causing the four tamp bars to describe short strokes in rapid sequence. The action on the block is not that of the usual gravity tamper but is a pressure pulsating through the block.

When tamping of the block is completed above the cores, the tampers are moved from side to side so that the whole block is thoroughly consolidated. When consolidation is complete, the feeding device moves back cutting and troweling off the block to the exact height of the mold box. With this device block cannot vary in height. Surplus concrete is carried back into the feeding hopper so that none falls upon the floor. Feeding concrete, tamping, troweling the finished block and removing the cores are all accomplished automatically. The mold box is opened by a single natural movement, the finished block pivoting upward and outward.

The illustration clearly shows the construction of the machines and shows the manner of off-bearing the finished product. On March 20, 1923 the machine at the left was timed for two hours in the presence of O. H. Gossmein, field engineer, Universal Portland Cement Company, and G. G. Praed, proprietor of the plant. During that period, which included the usual delays caused by removing loaded cars and placing empty cars in position, it produced three hundred and fourteen excellent standard eight by eight by sixteen, plain concrete blocks or an average of one hundred and fifty-seven per hour. There were employed during that time, one man on the mixer, one operating the machine and one off-



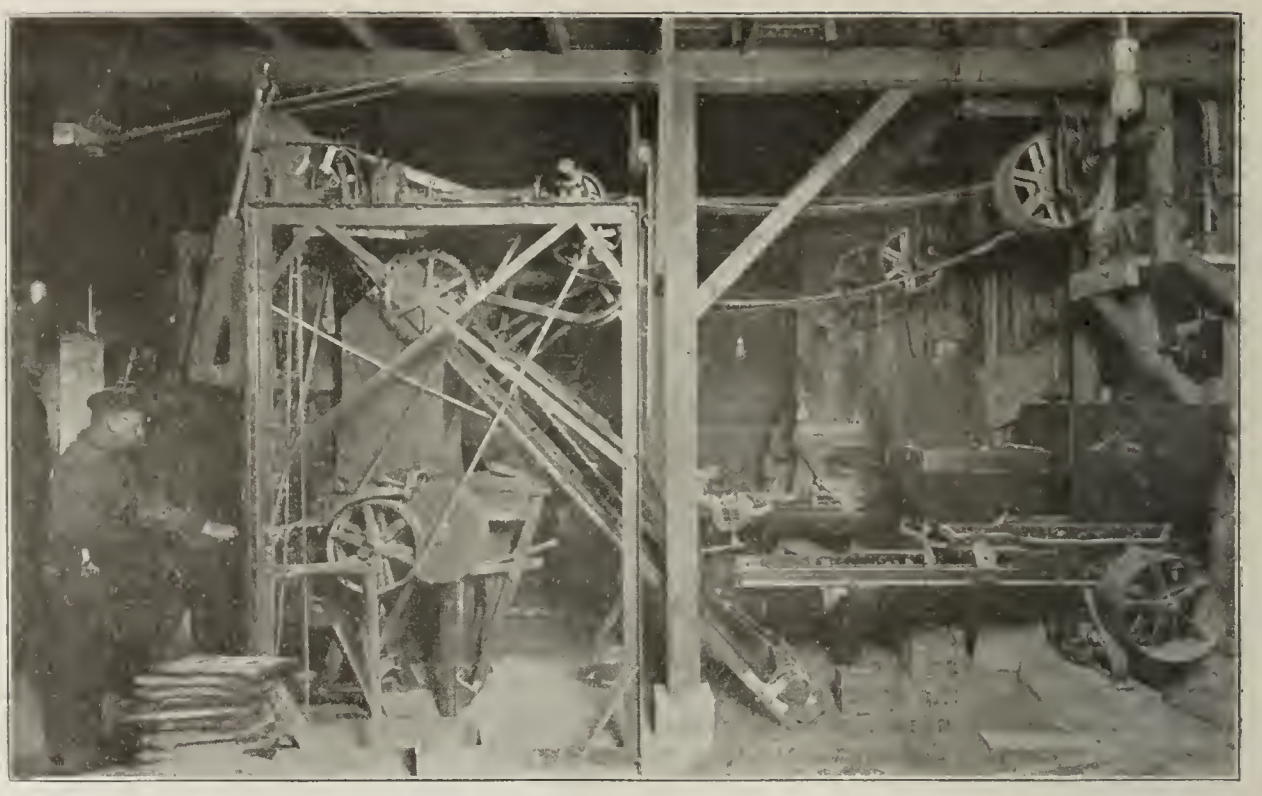
View of the Universal Automatic block machine with Chase cars in the foreground.

bearer. The normal production of each unit may be conservatively rated at 1200 per eight hour day, making a total capacity of 2400 blocks per day. The power required to run two mixers and two machines is furnished by a ten horse power. Red Band electric motor.

Steam Curing the Product

Blocks are taken from the machines and loaded on Chase rack cars which are placed on a short length of industrial track in front of the machines. There are forty of these cars in the plant of which eight are equipped with steel racks and thirty-two with wooden racks. Each car has a capacity of fifty blocks. Mr. Praed contemplates the immediate purchase of more cars and will equip them with wooden racks.

When a car is loaded at the machine it is pushed to the transfer track which parallels the west wall of the building. This transfer communicates with the entrance to the steam curing chambers which are a feature in the construction of this plant. There are three of them seventy-two feet in length. Each room is eight feet wide and accommodates two lines of twenty-four inch gauge industrial tracks. The three rooms are covered with a saw-toothed roof as shown in the illustration of the plant. The maximum height of the chambers is seven feet and the low side is five feet in height. Roofs are sealed on the lower side with Neponset paper and are covered with Barrett roofing felt. The doors communicating with the manufacturing room, are hinged at the top and when opened are supported by hooks swung from the ceiling. These doors are very carefully constructed and consist of three thicknesses of one-inch dressed lumber, combined so that the grain of the inner or central layer runs at right angles to that of the outer layers. The inner surfaces of the doors are also covered with Neponset paper, and the jambs are offset so that the doors fit with great exactness. Doors at the outer end of the curing chambers are of the same general construction but are hinged at the side and two swinging doors are provided for each compartment. It is noteworthy that when the doors are closed and blocks are being steam cured, there is not a single wisp of steam escaping. In the view shown, two doors in the center are closed on a chamber in which blocks are being cured.



The two No. 2 Kent continuous mixers which supply the Universal automatic block machines.

The Steam Generating Plant

Steam is generated in a forty horsepower Gem City boiler, located at the east end of the plant. A pressure of about ten pounds is carried. Steam enters a two-inch main line and passes into three one and one-half inch laterals each sixty-eight feet long. These laterals are placed in troughs between the two tracks in each curing chamber, and are perforated with one-eighth inch holes every ten inches throughout their length. Troughs are filled with water supplied by one-half inch water lines. Each of the steam curing chambers is equipped with a standard thermometer and the temperature of the rooms is maintained at from one hundred to one hundred and ten degrees.

At the east end of each trough there is a one-half inch overflow pipe which communicates with a sump near the boiler. This sump is pumped out and the water returned to the boiler by a small steam pump. Blocks are steam cured for twenty-four hours. The night man in charge of the boiler also cleans up the equipment used during the day. This arrangement is an excellent one, because it makes certain the proper care of the equipment.

Cars are taken from the west end of the curing rooms onto a transfer track running north and south and from there are rolled out on east and west tracks in the storage yard. Racks are unloaded and the empty cars returned by way of a narrow gauge track entering the north end of the building and communicating with the short track in front of the machines. With this arrangement cars are always moving in the same direction and there is no delay or blocking as is the case where the outgoing track is used as a return. A view of a portion of the storage yard with motor truck about to deliver a load of blocks is shown. Every effort is being made to carry a stock of about 15,000 blocks but the demand has been so great that blocks are no sooner made than they are sold.

Entrance of the curing rooms. The central chambers are under steam although none is escaping from the chamber.

Distribution of Personnel

The plant personnel consists of one man feeding aggregate to the bucket elevator, two operating the mixers, two machine operators, two off-bearers, two men in the storage yard and a superintendent. The superintendent of this plant is Frank P. Dillon who has had extensive experience in the building construction field. Mr. Praed, in addition to exercising a general supervision of all the operations of the plant, takes care of the advertising and sales.

Mr. Praed is a man of unquenchable enthusiasm, forceful personality, excellent business training and high ideals. In building his business he has put into effect his own slogan. He has determined that only concrete block of high quality shall be produced in his plant. He has built on a solid foundation.

Underground Mining for Slate

Although open pit quarrying is the most common method for obtaining slate, underground mining is followed under certain conditions, states Oliver Bowles, mineral technologist of the Bureau of Mines. Underground methods are now used at Monson and have been followed near Delta, Pa., and West Pawlet, Vt. The mine at Delta was abandoned some years ago, and work was suspended at West Pawlet during the recent war. Underground methods have been used more extensively in foreign countries, both in Wales and on the Continent, a famous example being the slate mines at Angers in France, where an overhead stoping method has been used successfully for many years. The French mines are probably the most widely known on account of their unusual methods, but it is claimed that the Oakeley quarry in North Wales is the largest underground slate operation in the world; slate has been removed from 26 levels. It has 50 miles of railroads, 4 miles of pump mains, and 12 miles of compressed air mains.

Only under special conditions can underground methods be successfully used. If the deposit is wide and relatively thin, or if the material is too unsound to form a safe roof, open-pit methods must be used, for slate is too low priced a commodity to justify the heavy expense of timbering. Only where the deposit is relatively narrow, of great depth, and sufficiently sound to afford a strong roof can ordinary mining be followed.

Rock Loading at Lime Quarries

Removing fragments of broken rock from the quarry floor and placing them in cars for transportation to the kilns is a very important lime-plant quarry process, states Oliver Bowles, mineral technologist, Bureau of Mines. At most lime plants rock-loading constitutes the largest single item of quarry cost. In view of the great expense involved in loading, a consideration of the relative merits of different methods followed, and the conditions under which each method may be most advantageously employed are worthy of more than ordinary attention. These matters are discussed in Serial 2446, which may be obtained from the Bureau of Mines, Washington, D. C.

Foote Bros. Gear & Machine Company, No. 213 North Curtis street, Chicago, has moved its New York offices from No. 145 Greenwich street to No. 100 Greenwich street, as the rapid growth of eastern business has necessitated larger quarters.

The Standard Scale & Supply Corporation has purchased and is now operating under a new management the business formerly conducted by The Standard Scale & Supply Company in the manufacture of scales, concrete mixers and contractors' equipment. The main office of the company is at 1631 Liberty Avenue, Pittsburgh, Pa.

Calvert Townley, assistant to the president, Westinghouse Electric and Manufacturing Company, has been re-elected a vice-president of the American Engineering Council and has been appointed a member of its finance and public affairs committees. He has also been made a delegate of the American Electrical Railway Association to the annual meeting of the U. S. Chamber of Commerce.

On April 26, 1923, Kongo Shokwai, moved to the Cotton Exchange Building, No. 60 Beaver Street, New York City.

Cement Statistics for March

Production of portland cement during March was unusually heavy for this season of the year. Mills of the country produced nearly 9,900,000 barrels, almost 2,000,000 barrels more than in February and nearly fifty per cent more than in March, 1922. Production for the quarter ending March 31 was considerably more than 25,000,000 barrels as compared with an average of slightly over 17,000,000 for that quarter during the five year period, 1919-1923.

Shipments from the mills during March, 10,300,000 barrels, established a high mark for that month and were more than forty-seven per cent greater than in March, 1922. For the first quarter of the year shipments were 21,500,000 barrels, a quantity greatly in excess of the amount moved in any similar period and approximately fifty-four per cent higher than the average for the five year period, 1919-1923. Stocks of finished cement in manufacturer's hands decreased about 450,000 barrels for the month or less than four per cent.

It is impossible to state how much of the amount shipped during the first three months has actually been used. From the unusual amount of winter construction which has been carried on, it is safe to assume, however, that the quantity used is greater than in any similar period. It is also a fact that greater quantities than heretofore have been stored up by the highway departments of a number of states, contractors and others in order to avoid transportation difficulties which are expected to increase when the active construction season opens.

Portland Cement Output In March

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The use of estimates was made necessary by the lack of returns from three producers.

Production, shipments, and stocks of finished portland cement, by districts in March, 1922, and 1923, and stocks in February, 1923, in barrels.

Commercial District	Production March 1922	Production March 1923	Shipments March 1922	Shipments March 1923	Stocks at end of March 1922*	Stocks at end of March 1923	Stocks at end of Feb., 1923
Eastern Pa., N. J. and Md.	2,189,000	2,659,000	1,991,000	2,511,000	4,268,000	4,336,000	4,188,000
New York	259,000	400,000	278,000	376,000	1,035,000	914,000	890,000
Ohio, Western Pa., and W. Va.	552,000	891,000	498,000	982,000	1,296,000	1,144,000	1,235,000
Michigan	229,000	443,000	284,000	457,000	756,000	674,000	689,000
Illinois, Indiana and Kentucky.	1,018,000	1,739,000	1,016,000	2,079,000	2,371,000	1,786,000	2,126,000
Va., Tenn., Ala. and Ga.	488,000	546,000	447,000	535,000	487,000	279,000	268,000
Eastern Mo., Ia., and Minn.	337,000	806,000	741,000	958,000	1,578,000	1,870,000	2,022,000
Western Mo., Neb., Kan. and Okla.	389,000	665,000	474,000	681,000	893,000	969,000	986,000
Texas	256,000	371,000	278,000	370,000	332,000	272,000	271,000
Colorado and Utah	120,000	112,000	132,000	133,000	160,000	140,000	161,000
California	697,000	1,014,000	721,000	1,011,000	377,000	145,000	141,000
Ore., Wash. and Mont.	151,000	234,000	142,000	233,000	295,000	526,000	525,000
	6,685,000	9,880,000	7,002,000	10,326,000	13,848,000	13,055,000	13,502,000

*Revised.

Stocks of clinker, or unground cement, at the mills at the end of March, 1923 amounted to about 5,184,000 barrels compared with 4,646,000 barrels (revised) at the beginning of the month.

Production, shipments, and stocks of finished portland cement for the 1st quarter by months in 1922 and 1923, in barrels.

	Production 1922	Production 1923	Shipments 1922	Shipments 1923	Stocks at end of month 1922*	Stocks at end of month 1923
January	*4,291,000	7,704,000	*2,931,000	5,419,000	13,316,000	*11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	13,848,000	13,055,000
First quarter	15,254,000	25,669,000	13,218,000	21,708,000	.....	.....

*Revised.

The Bureau of Foreign and Domestic Comerce, of the Department of Commerce, reports that the imports of hydraulic cement in December, 1922, amounted to 45,860 barrels, valued at $72,-791. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in December were, from Denmark, 40,136 barrels; Belgium, 2,871 barrels; Quebec and Ontario, 2734 barrels; Norway, 113 barrels; Mexico, 6 barrels. The imports were received in the following districts: North Carolina, 32,-498 barrels; Porto Rico, 7,638 barrels; San Antonio, 2,877 barrels; St. Lawrence, 2,341 barrels; Vermont, 393 barrels; New York, 113 barrels.

The exports of hydraulic cement in February, 1923, were 88,624 barrels, valued at $269,155, of which was sent to Cuba, 40,733 barrels; to the other West Indies, 9,245 barrels; South America, 19,-118 barrels; Central America, 9,359 barrels; Mexico, 7,691 barrels; Canada, 685 barrels; and to other countries, 1,793 barrels. The total exports of hydraulic cement in 1922 were 1,127,845 barrels, valued at $3,206,201.

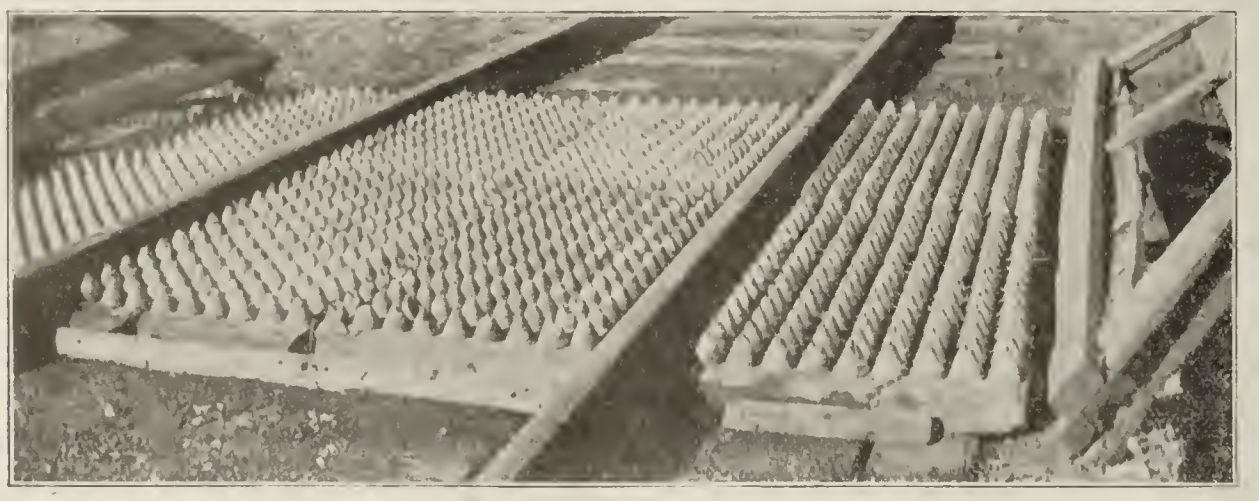
The statistics of imports of hydraulic cement from January 1, 1923 to March 31, 1923 and of exports of hydraulic cement in March, 1923, are not available.

Imports and exports of hydraulic cement, by months, in 1922 and 1923.*

Month	Imports (barrels) 1922	Imports (barrels) 1923	Exports (barrels) 1922	Exports (barrels) 1923
January	17,039	†	70,725	73,169
February	5,157	†	82,421	88,624
March	1,597	†	103,556	†
April	10,855	.....	75,412	.....
May	2,524	.....	100,068	.....
June	14,198	.....	96,263	.....
July	957	.....	119,491	.....
August	56,757	.....	105,156	.....
September	‡42,641	.....	78,615	.....
October	§65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823	.....	1,127,845	.....

*Compiled from records of the Bureau of Foreign and Domestic Commerce. †Imports in Jan., Feb. and Mar., 1923, and exports in Mar., 1923, are not available. ‡Imported during period Sept. 1-21, inclusive. Imports during period Sept. 22-30 are included with Oct. §Includes imports during period Sept. 22-30.

Concrete Cattle Guards Give Protection



The concrete cattle guard installed by the C. B. & Q. R. R. has proved highly efficient.

The problem of finding an efficient cattle guard which is practically immune to injury, has been solved in a satisfactory manner on the Chicago, Burlington and Quincy Railroad by the introduction of concrete guards of the type shown in accompanying illustrations.

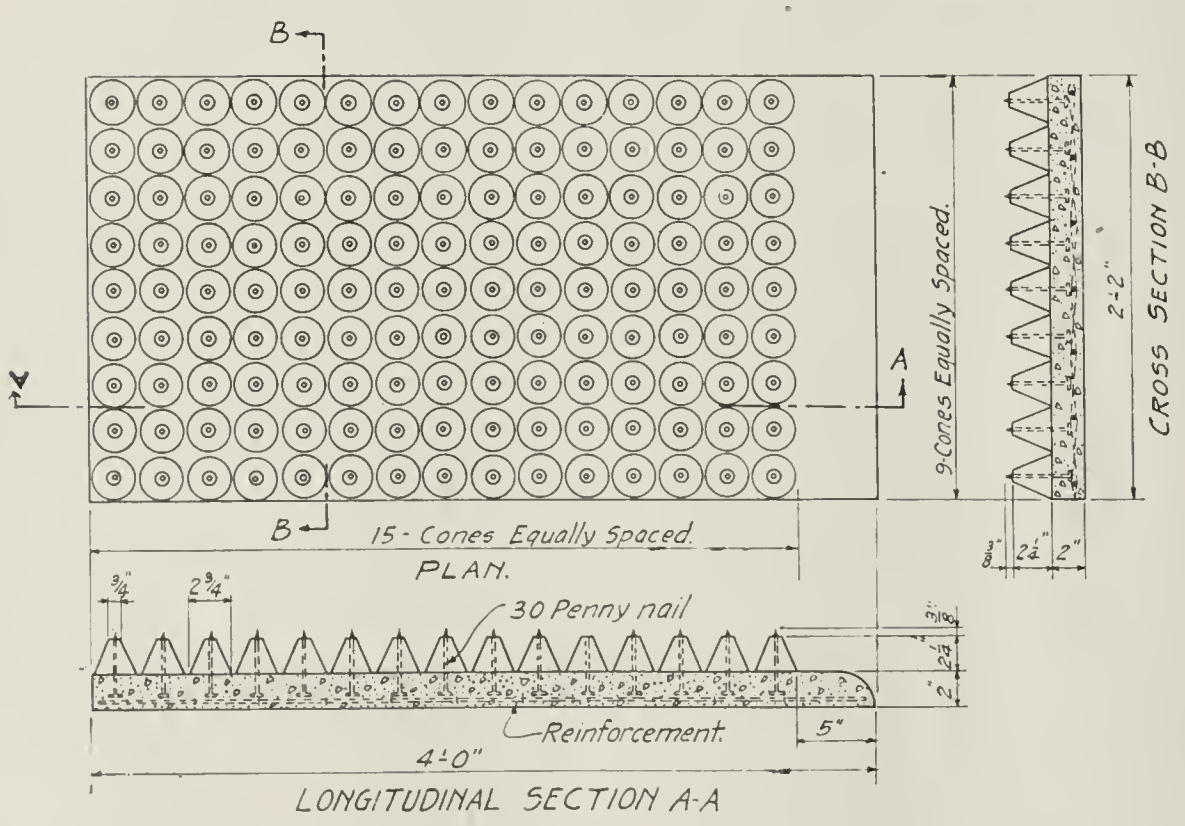
These guards consist essentially of concrete slabs carrying conical protrusions which make the surface impassable to stock of all kinds. The slabs proper have a thickness of two inches, the concrete cones protruding two and one-quarter inches further, and the thirty-penny nail which occupies the center of each cone rising three-eighths inch above the top of the cone. Each slab is four feet long and two feet two inches wide with corners conveniently rounded and carries fifteen cones in length and nine cones in width. Each slab weighs around two hundred and fifty pounds, sufficiently heavy to insure that they will remain where placed.

Method of Casting

The mold for casting these guards may be made by any one of a number of different methods. One of the most successful is to procure highly polished sheet iron or aluminum conical forms which are fastened into openings made at proper intervals in a heavy plank base The mold for the base of the guard is made by means of two-inch wooden strips screwed to the heavy wooden base. The mold is filled while upside down; a pallet is clamped to the mold and after a few hours the latter is turned over, the screws loosened and the mold carefully withdrawn. This leaves the piece right side up on the pallet. The mold must be carefully oiled with a very thin coat and kept clean and smooth.

Experience with this cattle guard over a period of eight years or more on the Chicago, Burlington and Quincy railroad through western cattle country has proven it to be very satisfactory, being easy and cheap to manufacture, install and maintain. Practically the only damage to date is reported to be due to dragging break beams, but of course this difficulty has to be faced no matter what type of guard is used.

There is an apparent opportunity for wide-awake concrete products manufacturers in many cities to manufacture and distribute cattle guards. Concrete guards are relatively inexpensive in first cost. Units of the type described in this article were recently erected at a cost of $16.25 per complete set for one guard, according to the *Railway Maintenance Engineer*.



Details of the cattle guard in use on the C. B. & Q. R . R. showing how it is manufactured

Meetings

The spring meeting of the Portland Cement Association will be held at the Chase Hotel, St. Louis, Mo., May 21, 22 and 23.

The Fifth Annual Convention of the National Lime Association will be held at the Hotel Commodore, New York City, June 13, 14 and 15, 1923. The work of the convention will be devoted in a large measure to reports from the technical men of the research organization, and from the field engineers of the association.

The twenty-sixth annual meeting of the American Society for Testing Materials will be held at the Chalfonte-Haddon Hall, Atlantic City, N. J., during the week of June 25th. From advance reports it is expected that this will be the largest meeting of the society ever held. On Thursday, June 28th, the tenth session will be devoted to cement, lime gypsum and ceramics. The twelfth session on June 29th will be devoted to concrete and many able speakers will be in attendance. Full details of the program will be given in the next issue.

The Fourth International Road Congress will be held in Seville, Spain from May 7-13 inclusive. The congress will discuss six questions as follows:

(1) Surfacing Roads With Concrete. (2) Use of Bitumen and Asphalt for Surfacing. (3) Laying Tramway-Rails on the Various Kinds of Road Surface. (4) The Development of Motor Transport. (5) General Traffic Regulations. (6) The Problem of Traffic on Congested Roads and Streets of Towns.

Among those who will discuss the surfacing of roads with concrete, the following are from the United States:

United States.—MM. Duff A. Abrams, Professor in charge, Structural Materials Research Laboratory, Lewis Institute, Chicago (Ill.); E. C. Blosser, State Highway Engineer of Ohio, Columbus (Ohio); H. Eltinge Breed, Consulting Highway Engineer, New York City; Roy W. Crum, Engineer of Materials and Tests, Iowa Highway Commission, Ames (Iowa); Arthur W. Dean, Chief Engineer, Division of Highways, Massachusetts Department of Public Works, State House, Boston (Mass.); C. R. Ege, Manager, Highways Bureau, Portland Cement Association, Chicago (Ill.); H. J. Kuelling, Construction Engineer, Wisconsin Highway Commission, State Capitol Annex, Madison (Wisconsin); H. S. Mattimore, Engineer of Tests, Pennsylvania State Highway Department, Harrisburg (Pa.); Clifford Older, Chief Highway Engineer, Illinois Department of Public Works, Springfield (Ill.), and B. H. Wait, District Engineer, Portland Cement Association, New York City.

This country will also be very heavily represented in the discussions of all of the other questions. The honorary president of the Congress will be the King of Spain and the honorary committee will be composed of four members of his cabinet.

Burrell Engineering & Construction Company has moved its offices to the new building at 513 West Jackson Boulevard. T. L. Burrell, secretary of the company states this change was made necessary by increased business and enlarged organization.

News of the Cement Mills

The Plastic Products Company, 956 Macomb St., Detroit, Mich., has been recently incorporated with a capital of $25,000 to manufacture plastic cement, etc.

It is reported that the million dollar cement plant of the Phoenix Portland Cement Company of New Birmingham, Ala. will be in operation during April.

Work on $1,000,000 cement plant on old Phoenix site to commence within 60 days by the Riverside Portland Cement Company, of Los Angeles, Cal.

The Missouri Portland Cement Company has declared the quarterly dividend of 1½ per cent, payable April 30, to stockholders of record April 20. Transfer books closed from April 20 to 22.

Louisville Cement Company, Speeds, Indiana has purchased a Traylor jaw crusher and it is expected that it will be installed during the latter part of April.

W. E. Bravender, Baldwin Park, Calif. writes us as follows: "A new cement company has been incorporated to operate in Southern California and will be known as the Arrow Head Portland Cement Company, with a capitalization of $2,000,000 and will be glad to advise you more fully later."

Indiana Portland Cement Company, 729 State Life Bldg., Indianapolis, Ind. is now engaged in installing at its plant at Limedale, Ind., a new kiln of the same size and capacity as one it has been using, viz.: of 1,200 bbls. per day, which will give it an output of 3,600 bbls. per day. The work is expected to be completed by August.

The International Cement Company for the quarter ending December 31, last, reports net income of $457,079 after charges and taxes, equal after preferred dividends to $1.33 a share on the 324,722 shares of common stock, compared with $432,929, or $1.25 a share, in the previous quarter, and net income of $189,263 in the fourth quarter of 1921.

To take care of the increased demand for cement present plans call for seven new mills of substantial capacity, to be in operation this year, which with a number of smaller units should increase the country's capacity to 150,000. It is estimated that actual production will be from 20,000,000 to 25,000,000 barrels over 1922.

The Alpha Portland Cement Company, Easton, Pa., will make extensions and improvements in its local mill, including installation of a new power plant and waste heat equipment. Other apparatus will also be purchased. The company has arranged an appropriation of $1,000,000 for extensions and betterments in its other mills in different parts of the country.

The Riverside Portland Cement Co., 762 Mills Bldg., San Francisco, Calif., which has been contemplating the construction of a cement plant in or near Phoenix, Ariz., wrote Mr. Henry Welch of the local Chamber of Commerce, in which it was declared that erection of a cement plant near Phoenix, Ariz., costing about $1,000,000 was planned by the above company. The plans are nearing completion and actual work is expected to begin within a few months.

Southeastern Portland Cement Company, Macon, Ga. organized with W. Jordan Masse, Pres. George P. Dieckmann, Vice-Pres. and J. E. Satterfield, Secretary and Treasurer, all of Macon, has purchased 600 acres of land at Ainslee, Georgia, about twenty-eight miles southwest of Macon, whereon it intends to build a cement plant with an annual outpnt of 1,000,000 barrels of cement. The plant will be in close proximity to the great lime deposits.

Toronto Cement Corp., Ltd., Toronto, Ont., Canada, has been recently organized with a capital stock of $3,000,000 by A. J. Young, president, A. M. Harley, vice-president and secretary, C. A. Patton, treasurer and H. C. Shields, superintendent. The company has taken over the plant of the Ontario Cement Company at Beachville, Ont., on which it is estimated that the limestone and clay deposits are worth $600,000. A plant to manufacture 4,500 barrels of cement per day is planned.

The Monolith Portland Cement Company, Monolith, Calif., is increasing the capacity of its plant. New machinery sufficient to bring the capacity to 3,000 barrels or 12,000 sacks per day has already been installed. Additional machinery has just been contracted for to increase the capacity which will be brought about the first of July. An official of the company states that contracts for machinery will shortly be executed with a view to increase the capacity to a total of 6,000 bbls. by January 1st, 1924.

Commencing within a short time, says the Oakland, Cal., *Tribune*, the north European countries are to start shipping large quantities of news print paper and cement to the Pacific coast ports, according to the rumor brought to Oakland by a big freighter. At the present time the European cement, which is of a high grade, can be brought into Oakland and set ashore at a cost of one dollar a barrel less than the domestic product despite the import duty. According to builders the cement is just as fine as the local product.

The Bland Engineering Company, L St. and Kennedy, N. E., Minneapolis, Minn., writes us as follows: "It may be of interest to you to know that we are just starting work on the new stock house and slurry basins for the Hermitage Portland Cement Company, of Nashville, Tenn. We are also engaged at the present time in the construction of new stock houses for the Signal Mountain Portland Cement Company of Chattanooga, Tenn., and the Pyramid Portland Cement Company, of Valley Junction, Iowa.

The workmen at the Brigham City cement plant of the Ogden Portland Cement company went back to work Saturday and the plant was in full operation Sunday morning. About a week ago the plant was shut down and the sixty-five employes thrown out of employment, on account of some difficulty arising between the company and the men over the wage question. Harold C. Day, manager of the plant, stated that the difficulty has now been adjusted and the big mill will again be kept at capacity operation.

The Universal Portland Cement Company announces that beginning June 1, 1923, Universal cement will be sold and invoiced by the sack instead of by the barrel. On cement sold prior to that date, the price per sack will be determined by dividing by four the price per barrel. On quotations and sales made on and after June 1, the price will be figured by the sack. This change is made only after sending an inquiry to thousands of cement buyers, including dealers, contractors, architects and engineers, large industrial concerns and others. The replies were overwhelmingly in favor of the change.

One of the largest transactions in the history of the cement industry has just been closed, by which several cement manufacturing plants of the Acme Cement Plaster company, including those at Acme, Tex., and at points in New Mexico, Oregon and Michigan, pass into the hands of the Certainteed Products company. The consideration is said to run well up into the millions of dollars. The purchase also includes large deposits of gypsum near Acme and other cement materials. The Acme Cement company was formed about twenty-five years ago to develop the gypsum deposits of the Acme section.

After ten months of labor on the part of the Forth Worth, Texas, Chamber of Comerce in trying to secure a cement plant for Forth Worth an announcement that a plant will be under way in the next few weeks was made by Roscoe Ady, industrial commissioner of the chamber.

Several weeks ago options were obtained by eastern interests on 550 acres of ground. Shortly afterward Carl Leonart, president; C. C. Merrill, vice president; O. J. Binford, secretary, and other officers of the Southwestern Portland Cement company came to Fort Worth. Early last week they contracted for 600 acres out of the John A. Jackson farm. Tests of the materials are being made and the company will build if the materials on this location prove satisfactory.

The plans as announced by Mr. Binford call for the erection of a plant of from 2,500 to 3,000 barrels daily capacity, employing from 200 to 225 men aside from the executive and sale forces.

J. M. Prim, farmer of Bachelor Valley, Calif., who prizes his beautiful ranch as one of the most ideal in the county, recently found cement and other mineral deposits on his property while boring for water. An analysis of the specimens sent to the assayer show the deposits to contain 13.80 per cent aluminum which is considered a fairly high test. Four other minerals that make up the cement analysis are, iron oxide, 7.95; magnesia carb., 3.10; lime carb., 2.50; silica 42.25. While the lime deposit is a trifle low in the test, experiments have shown that a good cement base can be made using only water for a mixture. More specimens of rock have been sent away, it being the belief of Prim that the rock in the vicinity may contain other valuable mineral deposits.

Quarry, Sand and Gravel Items

The Peter & Burchard Stone Company, Louisville, Ky., has increased its capital stock from $200,000 to $300,000.

The Berkshire Glass Sand Company, Cheshire, Mass., has been taken over by C. J. Curtin and C. J. Curtin, Jr.

J. Mugica, Engineer Tolosa, Spain, contemplates erecting a plant for calcining and grinding gypsum for plaster.

H. H. Beal of Berryville, Ark., has decided to establish a lime manufacturing plant there.

The Salisbury Granite Corp., Salisbury, N. C., has been recently incorporated with a capital of $50,000 by P. A. Wallenborn, M. DeFraley and others.

The Railroaders Lime Company, G. B. Crow, general manager, Corydon, Ind., will build several kilns and open a quarry.

The American Crushed Rock Company, White Sulphur, Ohio, has been recently incorporated with a capital of $500, by A. S. Kecker, and H. Schmidt.

The Missouri Red Granite Company, St. Louis, Mo., has been recently incorporated for $50,000 by J. M. Brod, Jr., G. F. Welsh and others.

The Osage Sand & Construction Company, Nevada, Mo., has been recently incorporated in Oklahoma for $25,000 by A. J. Daly.

The Bridgeport Sand & Gravel Company, Bridgeport, Conn., has been recently incorporated with a capital of $20,000 by Angelo Cocco and others.

The City Commission of Everett, Wash., has leased to R. Reardon and S. McGee a portion of Riverside dock on which to construct gravel bunkers.

The Incorporated Gravel Company, Dallas, Texas, has been recently incorporated with a capital of $2,100.00 by E. R. Cantrell, A. E. Doss and F. Corenbleth.

The American Sand Company, Turner, Kansas, has been recently incorporated with a capital of $100,000 by H. B. Thompson, R. B. O'Brien and L. W. O'Brien.

The Central Sand, Stone & Supply Company, Johnstown, Pa., has been recently incorporated with a capital of $30,000 by H. B. and C. M. Toomey and Leroy J. Scanlon.

Farmers of the Antioch Community Club, Wetzel County, Farm Bureau, New Martinsville, W. Va., at its last meeting decided to get a lime crusher to crush their lime as needed.

The Millwood White Sand & Products Company, Howard, Ohio, has been recently incorporated with a capital of $150,000 by L. Senter, Rees H. Davis, C. M. Vrooman and S. Graham.

The France Stone Company, of which N. R. France is president, has purchased the Hopewell township quarry of the National Lime and Stone Company. The consideration was about $5,000.

The New Mound Street Sand & Gravel Company, Columbus, Ohio, has purchased machinery for their plant from Siebert-Milburn Company and is expected to have a daily capacity of 300 tons.

The Birdsboro Co., 1004 Land Title Bldg., Philadelphia, Pa., has been incorporated for $2,000,000 to operate a stone quarry by S. F. Glenn, J. M. Hutchinson and J. F. Glenn, all of Philadelphia, Pa.

The Laurel Hill Sand & Gravel Corp., Queens, N. Y., has been recently incorporated with a capital of $15,000 by M. C. Becker, J. W. Newman, and H. H. Kutz.

The Sterrett Sand & Gravel Company, Springville, N. Y., has been recently incorporated with a capital of $20,000 by F. W. Sterrett, W. Sunderland and H. A. C. Grotke.

The New Castle Molding Sand Co., New Castle, Pa., is planning extensive improvements at its plant which will cost $4,000 and will include sand bins, chute and screens and a side-track in the company's molding sand deposit.

A large deposit of high-grade limestone has been recently found on the Schneider Brothers farm near Lancaster, Wis., testing ninety-six per cent pure. They will install a crushing and pulverizing machine at once to crush limestone.

The Hagerstown Lime & Chemical Company, Hagerstown, Maryland, is taking bids for its new plant, to include crushing and pulverizing machinery, mechanical drying equipment, etc. J. S. Meyers, is president.

The Ashland Limestone Company, Carter, Ky., has been recently organized with a capital of $100,000 by R. F. Hill, Jr., of Orange, Va., M. E. S. Posseg, Ashland, Ky., and W. S. Hoge, Washington, D. C.

The Pratt Rock & Gravel Company, Clarence F. Pratt, president, San Francisco, Calif., also president of the Pratt Building Material Company, soon will build a crushing plant betwen Sacramento and Folsom near Placerville branch of the Southern Pacific.

The Kelly Island Lime & Transport Company, Cleveland, Ohio, has recently acquired the property formerly owned by the Great Lakes Stone & Lime Company, near Alpena, Mich. The plant is located at Rockport, to which point a large quantity of machinery is being hauled.

The American Ochre Company, Luidelle Bldg., Seattle, Wash., has found a deposit of kaolin, ochre and sienna five miles north of Deering Park. At present money is being raised to buy a steam shovel or stripper to remove overburden of 7 feet of dirt and to purchase crusher, ball mill and dry kiln.

The Universal Gypsum Company, 111 W. Washington St., Chicago, Ill., has been recently organized for $4,000,000. They have plans under way for the erection of one of the largest plaster plants in the world at Port Clinton, Ohio. Wm. E. Shearer is president, E. C. Williams, vice president, and J. A. Henley is secretary.

G. W. Focht Stone Company, Inc., 400 Baer Bldg., Reading, Pa., operates a quarry at Tuckerton, Berks county, Pa., with a daily capacity of 500 tons. It has three crushers; one 18x36 inch Traylor jaw crusher; 2 8-inch Traylor gyratories. It has recently installed a second 8-inch gyratory. Operate an Osgood 18-inch with ¾ cu. yd. bucket loading quarry cars in the pit.

Liquid oxygen as a blasting explosive was given its first public demonstration in the United States on February 7, at the quarry of the Kelly Island Lime & Stone Company, near Martinsburg, W. Va., when Adolph Messer, head of the German firm of Messer & Company, conducted tests under arangements made by the U. S. Bureau of Mines. George S. Rice, the Bureau's chief mining engineer, attaches great significance to the Martinsburg tests as showing that liquid oxygen may be successfully used in deep holes—16 to 20 feet. An appropriation will be available July 1 for a further study of liquid oxygen explosive by the Bureau of Mines.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of CEMENT AND ENGINEERING NEWS, published monthly at Chicago, Ill., for April 1st, 1923.

State of Illinois } ss.
County of Cook }

Before me, a Notary in and for the State and county aforesaid, personally appeared David Williams, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Cement & Engineering News, and that the following is, to the best of his knowledge and belief a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, I. M. Seafert, 22 Quincy St., Chicago, Ill.; Editor, E. S. Faussett, 22 Quincy St., Chicago, Ill.; Managing Editor, E. S. Faussett, 22 Quincy St., Chicago, Ill.; Business Manager, David Williams, 22 Quincy St., Chicago. Ill.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) I. M. Seafert (sole owner), 22 Quincy St., Chicago.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stock holders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

DAVID WILLIAMS,
(Signature of Business Manager.)

Sworn to and subscribed before me this 30th. day of March, 1923.

[SEAL] F. C. Waxman.

(My commission expires June 13, 1925.)

Cement
and
Engineering News

Vol. 35 Chicago, June, 1923 No 6.

Vast Cancellations May Be Healthy Sign

The Danger of a Financial Crash Is Averted If Speculation and Wage Inflation Is Removed—Volume of Work Proceeding Is Sufficient to Insure Prosperity for All

The construction industry in America is today, and has been for the past six months, prosperous to a degree. And through the prosperity of that industry has come prosperity to the lumber camps, the brick yards, the planing mills, the cut-stone quarries and the cement mills, likewise to the artizan and dealer in these and all other building materials. There is one thing and one thing only that has produced the present happy condition in the construction and allied industries, and that is a situation which offers to capital a profit-making chance in the erection of homes, apartments and industrial and commercial structures.

One thing and one thing only will terminate this condition. That is the creation of a situation where capital is not promised the chance for proper remuneration on investment or where the safety of the investment is itself jeopardized. Present economic conditions are such that investments in buildings of any nature present a favorable prospect. The most serious work before the industry and before the nation as a whole is to prolong this condition. In considering the necessities of the situation certain definite facts must be faced.

For example, no man is going to engage in apartment construction unless the rentals which may reasonably expected to be derived therefrom are sufficient to pay all interest and carrying charges and to provide a sufficient amount which may be set aside as a sinking fund with which to replace the monies originally invested. Costs must be balanced against rental—not only against the rent that may be collected at the time of erection of the structure, but also the income that may be depended on for some years to come.

When private home construction is under consideration it must be remembered that no man is going to invest hard dollars in a domicile, be it cottage or palace, unless the interest on the first cost does not exceed a fair approximation of the rent he would have to pay on quarters of similar convenience if obtained under lease. Neither does the average man care to undertake home construction unless he can be fairly well assured that completion of the undertaking can be accomplished within a certain time limit. Further, the builder of a home must feel secure in the continuity of his income. If any of these three factors are missing from the general economic situation, the number of men who are willing or desirous of venturing on private housing construction speedily decreases.

Industrial construction activity is even more delicately balanced in its relation to the general condition of financial and commercial circumstances. In such cases an actual cash return is not expected from the building, but knowledge must be as near certain as is possible that the manufacturing enterprise which is to be conducted therein will produce a financial return in keeping with the volume of money that must be expended in its erection; also that costs are not going to drop in the near future to a point which will render the construction a foolish extravagance.

What has been said of the various classes of building construction applies similarly to the building of office buildings, theatres, or any other construction from which a monetary return, either direct or indirect, is necessary. Municipal, county, state and federal construction only, are, to a certain extent, immune from the above laws, yet even in such work costs can by no means be wholly overlooked, although the general public through taxation, pays the bill, regardless of its size.

The most important matter of the present to the American business man is: "How long will the present construction activity last; What can be done to prolong the existing 'good times' in the industry; how far can future business plans be predicated on existing conditions?" Recent authoritative reports that vast contemplated expenditures have been cancelled has put a sharp point to the question and has given rise to serious misgivings in the minds of many. The cancellations are reported as of varying totals, $100,000,000 being mentioned as the New York figure, $75,000,000 in Chicago and $125,000,000 in the country at large, these estimates making a total for the United States of $300,000,000.

The above figures are derived from a survey or the most spectacular projects which are announced as delayed, and it is probable that the figures mentioned represent only the total of those large propositions. It is not beyond probability that these figures would be materially swelled if it were possible to ascertain how many inconspicuous propositions, homes, garages, small apartments and similar comparatively inexpensive contemplated structures have been indefinitely postponed. It would be a foolish estimator who would attempt to fix anything other than a wide approximation on the total sum involved.

Far from being an occasion for alarm, to the one who clearly views the present situation, these vast cancellations present what is probably the most reassuring single feature of present conditions. This for reasons that it shall be the endeavor of this article to make clear. American business, as various widely known economists have frequently pointed out, has a habit of proceeding in giant swings up toward the peak of prosperity and down to the depths of depression, a record of its course closely resembling the movement of a pendulum. And, as in the case of the pendulum, the greater the swing in one direction, the greater will be the balancing swing in the opposite way. If the present upward swing is kept within reasonable bounds, it is only to be expected that the reverse movement will be slower in taking place and less violent in its reaction. Indeed, if the forces which have brought about present day prosperity can be properly controlled, there seems to be no good reason why the upward swing can not be made to last for several years and to produce a more or less permanent condition of relative prosperity.

In studying the present situation we have the advantage of past experience so recent as to be fresh in our memory. Other booms we have had before, and each has been followed by a resounding crash, but prior to this time the occurrences have been so distant one from another in point of years that each such experience was new to the interests involved. In this case, however, the executives of today are the same individuals who were at the helms of business two years ago and many of them fourteen years ago, when parallel economic history was made. It is said that no man can be blamed for making a mistake, but condemnation is unreserved for the one who makes the same error twice. The business heads who boomed their commercial crafts on to destruction in 1920 have probably learned their lesson and will not repeat the former errors which are still remembered. The present tendency toward conservatism, expressed in cancellations and recessions, is merely the reefing of sails when the barometer drops as the storms of two years ago taught was necessary.

It seems strange and very disappointing that, just as the wheels of American business get to spinning at high speed it should be necessary to put on the brakes. It would be a wonderful world in which to live if we could just rush along, buying and building, renting and selling, always on an increasing scale of values and returns, or even on a fixed basis of the present high values. The two things which render such a course impossible are the wildness of the speculation that gets into the blood of a certain class of business men under conditions of prosperity, and the selfishness, avarice and shortsightedness of union labor

under such conditions. The activities of either of these elements, unimpeded, would collapse the most substantial prosperity the world has ever seen. Allowed to work together to the limit of their extreme tendencies, the basic prosperity of our nation would receive a blow from which the present generation would never see recovery. Therefore can it be said with absolute assurance that the present curbing of activity is cause for congratulation rather than alarm.

Reference to very recent history only is necessary to demonstrate this fact. In the fall of 1919 and the spring of 1920 everybody prospered. Released from the strain and worry of war and from the patriotic necessity of war-time saving, the country entered on an orgy of spending which has been aptly designated as the "silk shirt era." Over a period of months the average retailer, regardless of his line, saw his gross business increased by five per cent or ten per cent or even more every month. With a normal business expectation that may be expressed as 1000 sales units a year, he found himself doing business on a basis of 1,100, 1,200, or more, each month, and he fatuously believed there was no end. Prodding his wholesaler for more ample supplies of various commodities, he hit upon the expedient of doubling his requirements on all orders placed, and then doubling again in a frantic effort to secure enough goods with which to supply the trade—the phantom trade—he saw coming.

Wholesalers saw the same mirage. Concerns doing a normal $1,000,000 per annum business found their unfilled orders on file amounting to four or five times the normal year's business. Rushing to cover, that none of that golden flood of business might be lost, they overwhelmed the manufacturing interests of the country with a volume of business such as the world has never seen before. And the manufacturing interests fell! Not stopping to analyze national consuming capacity, they went ahead with production plans and raw material orders enough to double or treble the requirements of the nation. Nor did it end there. Visioning an unending growth, construction was started apace, and the rattle of the concrete mixer and the snort of the donkey engine resounded throughout the land. The sequal was found in a scant ten months, when hundreds of acres of newly constructed floor space stood, not only idle, but without having had one day's use made of its vast facilities.

Speculators, seeing the constant rise in values, bought and built to sell and lease, and for a time prospered until the bubble bursted and the daily "morgue lists" of the commercial agencies read like a roll call of a certain class of business. Only the fact that construction projects take a long time to get under way prevented a greater building boom in the early days of 1920 than we have today and, by the same token, a crash in the building game that would have reverberated even until now.

The crash of '20 followed by the quiet days of '21, brought about a lowered living cost and a most complaisant attitude on the part of labor. Overgrown wage scales were intelligently pruned and, as a result, when business took a fresh start and recovered from the solar plexus blow of the fall of 1920, construction began in encouraging volume. Consistently it has grown until at present practically every nerve is strained to the utmost to meet the demand made upon the industry. And just as consistently labor has re-assumed its air of arrogance and avarice until some brake on its imperious path is absolutely necessary.

As was pointed out earlier in this article, there is an indefinite line somewhere on the upward course of costs beyond which even the pressure of dire necessity will not cause investing capital to pass. This is the lesson which labor must learn, regardless of its reluctance so to do. This line is indefinite. A bricklayer may be worth $5 a day, $8 a day or $10 a day; the writer would not venture to fix a figure. But it is obvious that one is not worth $25 a day and no one would pay that figure regardless of how badly they needed his services. Somewhere on the upgrade the line is crossed above which no laborer can obtain work, and this line labor seems to have come perilously near crossing.

Through some peculiar narrowness of vision, labor, as a class, has adopted as its own the old and discredited slogan of the railroads—"the public be damned." It has seized on every opportunity to force scale increases, bonuses, overtime—anything and everything which can be worked to squeeze another dime out of a reluctant public. As a salutory lesson and a forceful demonstration of the futility of forcing wages too high, the present course of events is invaluable. Why the present cancellations and postponments will be of benefit is clear.

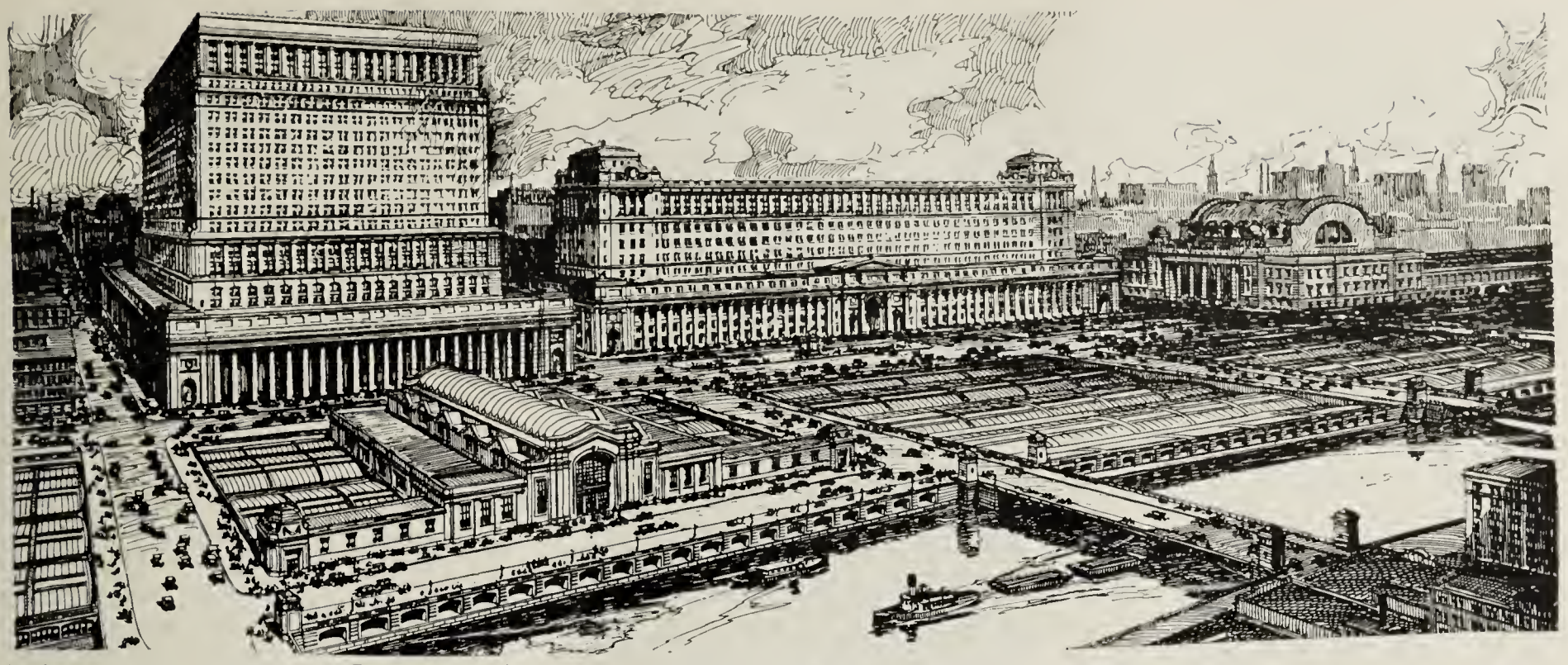
Work that may be termed essential, for instance, the millions being spent by the railroads in repairs and betterments and the erection of a certain volume of housing, is going ahead. It is of sufficient volume to keep the industry comfortably busy. Such an extension of activity as was represented by the three or four hundred millions of proposed work now cancelled would have merely created senseless bidding for labor and supplies, as a result of which labor costs and possibly material costs would have leaped so fast as to cause the collapse of the entire structure.

The recent action of the American Construction Council stamps the approval of thinking men on the present trend of events. In the face of boom conditions, the curtailment of speculative financing of new building would appear to be the obvious course in consideration of the history of all booms from the Mississippi Bubble down to date. The giving of publicity to the increasing costs in the industry will prevent the maturing of ill-digested plans. This will prevent what we have seen too often in America—numbers of partially finished structures abandoned on account of lack of sufficient funds to complete the work. The delay of governmental and other public work will permit such work to be used as a reservoir of jobs in the days which are bound to come when demand for labor is not so urgent as in the present case. Soliciting the cooperation of the press is the obvious course in any worth while campaign.

Fortunately, the crazy course of boom financing and boom wage boosting has not gone so far, to date, as to be beyond remedy. It is but a few weeks since the wave of wage increases, starting in the steel industry, began to sweep the country. Already the force of these millions of cancellations is beginning to be felt in the proper direction. Less talk is heard of strikes in the various trades, and in some instances a spirit of compromise is beginning to creep into the camp of the labor unions. As a concrete example, several organizations have signified a willingness to renew their old agreement in Chicago under what is known as the Landis Award.

In summing up it is safe to say that today's business skies are clear. That is not to say that no squalls are coming, for even the fairest of seasons has its occasional brief storm. But with the spirit of conservatism which has been injected into the construction industry, and with the concurrent rule of reason which is being forced on labor and on material costs, no combination of events can be seen in the immediate offing to greatly mar the existing conditions. If all necessary building is immediately proceeded with, and if non-essential work is postponed until it becomes essential, there is enough of capital, enough of demand and enough of solid prosperity in America to keep our workers busy at fair remuneration for years to come. All the industries mentioned in the opening paragraph of this article, the lumber camps and brick yards, the planing mills and stone quarries, and the cement mills can look confidently into the future.

The accompanying illustration shows the Huron river bridge in Wayne County about four and one-half miles northeast of Carleton, Michigan and is a double track four-forty foot span, segmental arch on a seventy-five degree skew. This is one of the improvements installed by the Pennsylvania system on its Pennsylvania Detroit branch.



This picture suggests what Chicago has in mind in the way of adequate terminals. In the left background may be seen the station building which ultimately will be twenty-two stories high. Immediately in front of it is the Concourse building. In the middle background is the suggested Post Office with the modern C. & N. W. station at the extreme right. In the lower right foreground is the Monroe Street bridge.

Chicago's Dream Coming True

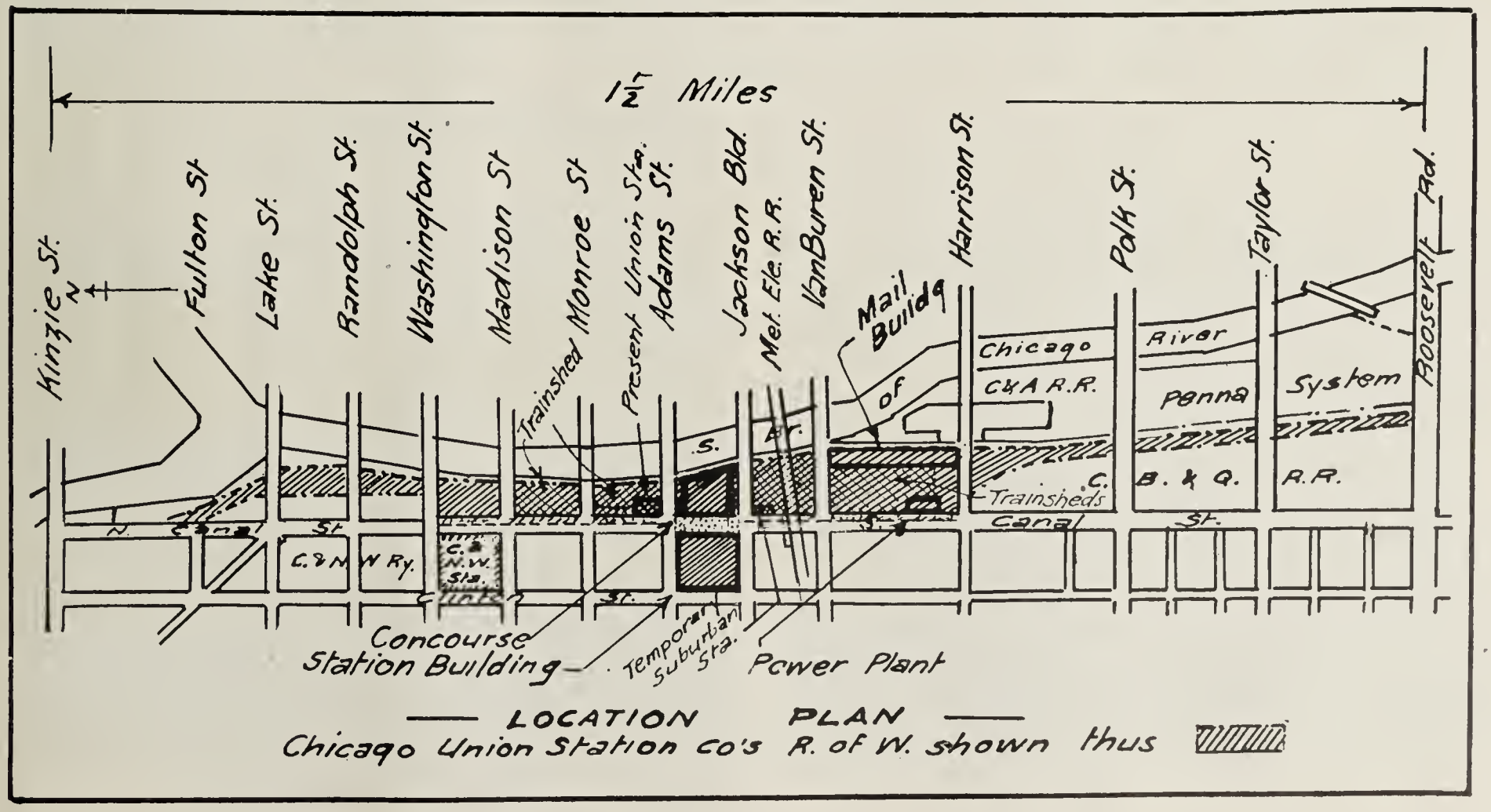
The Sixty Million Dollar Project to Provide Chicago with Modern Terminal Facilities Approaches Completion. Extensive Use of Concrete in This Great Undertaking

By A. S. Holmes

With the steel for the station building in course of erection, Chicago's great terminal project is now within measurable distance of completion. For seven years the Chicago Union Station Company has been building viaducts and bridges, raising and widening streets, installing new sewer systems and relaying public utilities; a sixteen-story warehouse building occupying a city block has been erected to take the place of buildings on land absorbed in its right-of-way, and a mail building, the largest of its type in the country, with track capacity for sixty-one postal cars, has been put in service.

The station company comprises the Pennsylvania system, the C., B. & Q. railroad and the C., M. & St. P. railway, and the new station will be used by these companies and the Chicago & Alton railroad.

The company's property occupies thirty-five acres west of the south branch of the Chicago river and extends for one and one-half miles from Roosevelt Road on the south to beyond Fulton street on the north, and with the exception of the station building, is all east of Canal street. The station building now being built occupies the block bounded by Canal street, Adams street, Clinton street and Jackson boulevard. Directly opposite this building, on the east side of Canal street, and connected with it by using the space under Canal street, the concourse building will be erected, and although an independent structure, will constitute a component part of a unified



plan, all at one level, extending two blocks from Clinton street under Canal street to the river.

Throughout the entire extent of its territory, or in what is termed the Union Station zone, all streets have had to be rebuilt and many of them widened. Foremost amongst these works has been the Canal street improvement. This street has been raised and widened from eighty feet to one hundred feet between Roosevelt road and Washington street, and between Taylor street and Harrison street is a double deck structure. In the filled sections between Harrison street and Jackson boulevard, and between Adams street and Washington boulevard, excepting a short section fronting the present station, concrete retaining walls have been built to support the westerly sixty feet of Canal street, the easterly forty feet of which street will be occupied below by two of the station company's tracks. Retaining walls are of the gravity type, supported on 35-ft. wood piles and are designed with bridge seat for girders spanning two railroad tracks and supporting the easterly part of the street. The total length of wall is 2700 lineal feet, averages 23-ft. in height, and contains about six cubic yards per lineal foot. A 7 ft. 6-in. passageway 270 feet long leading from the proposed concourse floor under Canal street at Jackson boulevard has been constructed in, and as a part of, this wall south to the Metropolitan elevated railway station. The greater portion of the retaining wall was poured by chute from construction towers although some short sections were poured direct from mixers placed on Canal street.

The raising of Canal street and the viaducts east of Canal street two to eight feet above their former level, in order to obtain clearance for tracks below, necessitated the reconstruction of the street approaches from Clinton street. The latter are on fill, new concrete curb and basement walls flanking the approaches having been erected to conform with the new street grade.

Along the river front between Madison street and Jackson boulevard a concrete dock wall, also of the gravity type, has been constructed. This wall is twenty-seven feet high with 13 ft.-6 in. base and is supported on four rows of 35-ft. wood piles. In the construction of the north section of this wall the usual puddle core type of coffer dam was used, but on the south section the contractors, the Great

Dock walls—north section.

Lakes Dredge & Rock Company, employed a special type of coffer dam which had the advantage not only of requiring only one row of piling for the outer wall of the coffer dam, but less bracing than is required with the puddle type wall. In this design, which was patented by the contractors, the outer wall consisted of individual steel interlocking piles having a heavy timber bolted to the inside of the web. To the side of the timber, wooden strips were spiked and the combination pile driven to the desired depth.

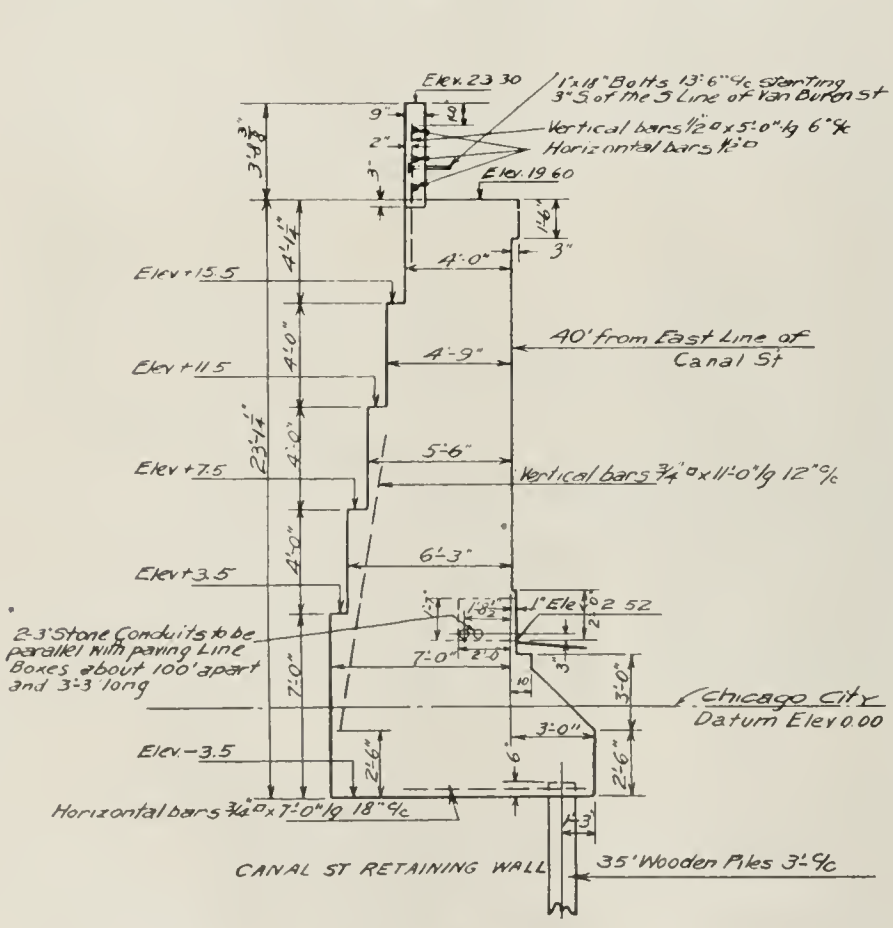
After the combination piles were driven, the spaces between the timbers were closed by driving vertical planks in the grooves formed by the wood strips, and the pocket thus formed behind the joints in the steel piling were then closed by filling the pocket with sand, sawdust or like material.

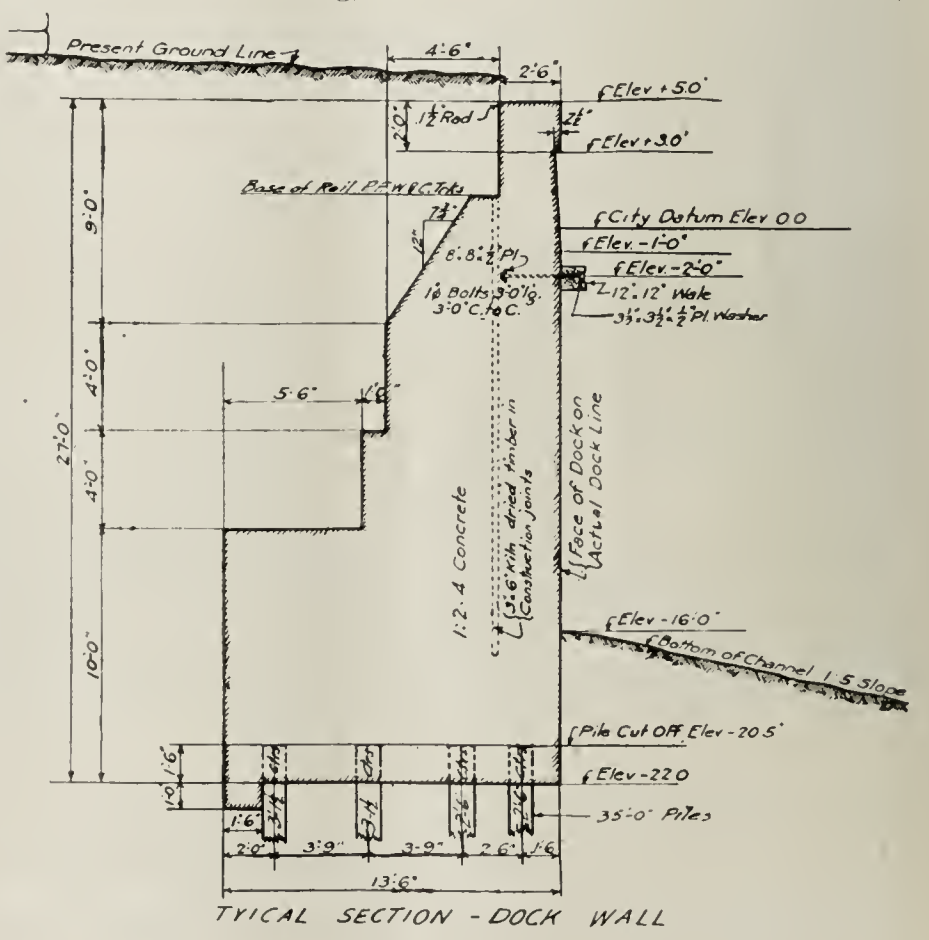
All construction operations on the dock wall, comprising coffer dam, pile driving, sheet piling, concrete mixing and placing were conducted from scows, the dock or bearing piles being driven by floating rigs in the river before the construction of the coffer dam.

Curb walls of 1:2:4 concrete support streets on three sides of the headhouse or station building, and vary from twenty-four feet to thirty-four feet in height. On the Adams street and Jackson boulevard sides, only a small encroachment for bracing and sheeting was permissible, owing to the heavy traffic on these streets. This necessitated a cantilever wall of a special type, having vertical face and uniform thickness with practically no heel towards the street and a heavy projecting toe. The street floor framing of the eight-story building, when erected, will abut against the top of this wall and the basement floor will afford support at the bottom, but as steel erection did not follow construction of the wall, it was heavily reinforced in order to be self-sustaining. As an additional support, filling was placed on the front of the wall on its completion, pending the erection of steel. Two-ply Minwax waterproofing membrane was used. The waterproofing was placed on the face of the back sheeting of the exca-

Dock walls—south section.

vated trench after which the walls were poured and the back sheeting and walings left in place. This process proved quite satisfactory and was also adopted on account of the limited space for bracing, which has been referred to. It was,

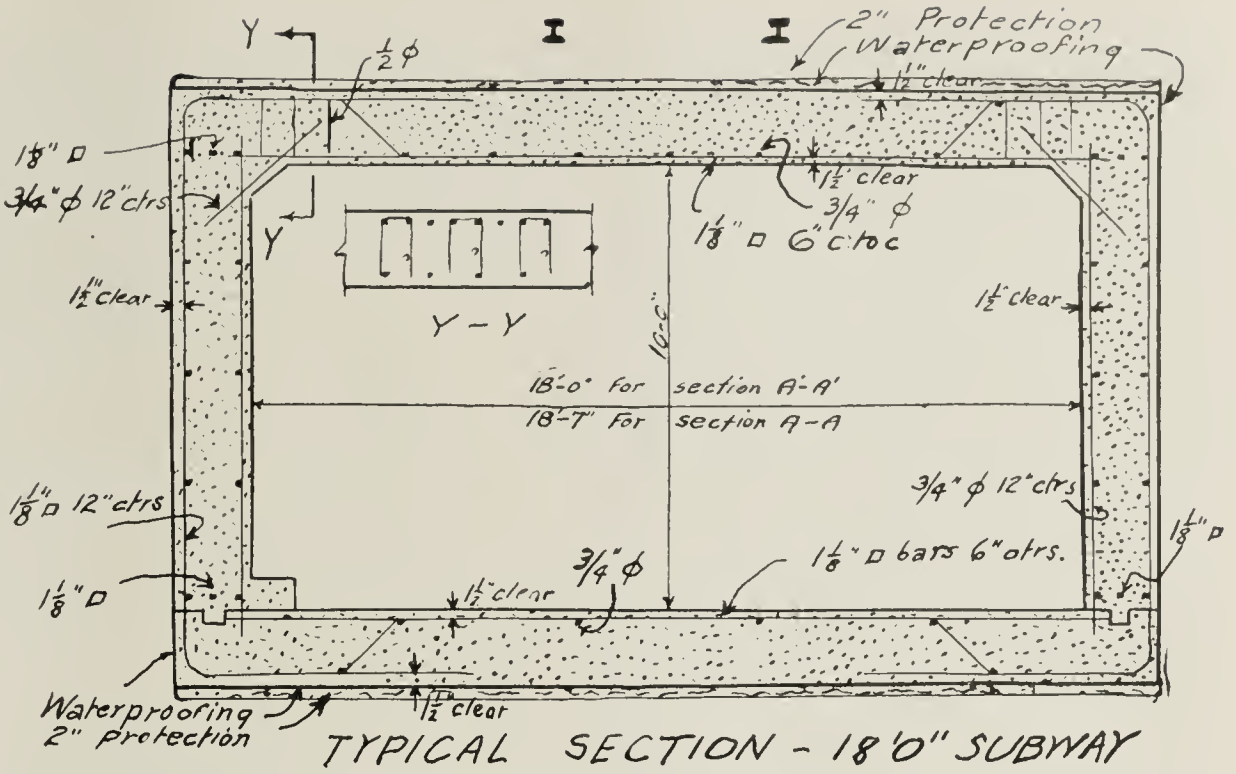

Elev. 23 30
1"x18" Bolts 13'6" c/c starting 3"S of the S Line of Van Buren St
Vertical bars 1/2"x5'0" lg 6" c/c
Horizontal bars 1'0"
Elev. 19 60
Elev +15.5
Elev +11.5
Elev +7.5
Elev +3.5
Elev -3.5
40' from East Line of Canal St
Vertical bars 3/4"x11'0" lg 12" c/c
2-3' Stone Conduits to be parallel with paving Line Boxes about 100' apart and 3'3 long
Chicago City Datum Elev 0.00
Horizontal bars 3/4"x7'0" lg 18" c/c
CANAL ST RETAINING WALL
35' Wooden Piles 3'-0 c/c



moreover, less expensive than making additional excavation at the back of the wall in order to apply the waterproofing when the wall was poured, the usual practice when conditions permit.

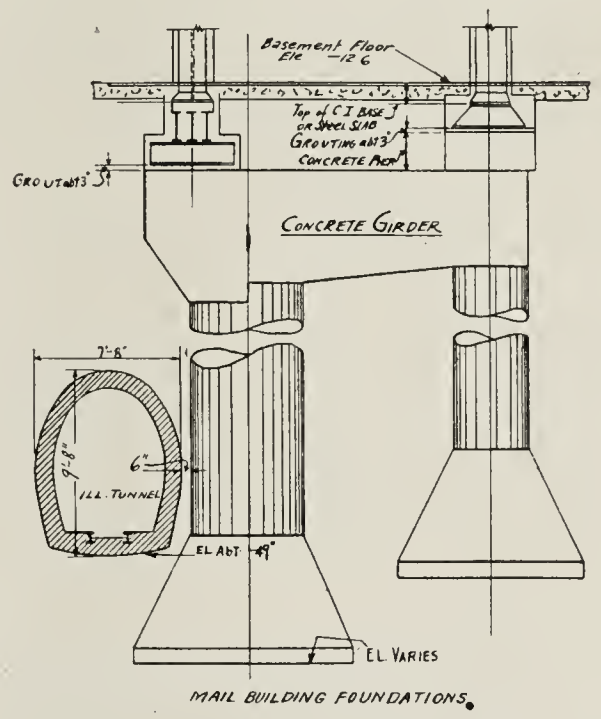
This work, together with the construction of 268 concrete cylinder piers, was completed in 1920. The cylinder piers then constructed were foundations for a monumental station building only. Subsequently, the decision of the station company to erect an eight-story office building with foundations and steel providing for a future twenty-two-story building, has resulted in the construction of 181 additional piers which have recently been completed. The work completed in 1920 comprised 80,000 cubic yards of general excavation, 15,000 cubic yards of excavation for concrete piers and girders, 13,600 cubic yards of concrete in piers and 780 cubic yards of concrete in the reinforced concrete girders. The piers and girders recently completed required 15,000 cubic yards of concrete, and wall and superstructure on the Canal street section, 7400 cubic yards. The concrete girders support columns, the locations of which do not permit of a pier being placed directly below them. There were many cases of this kind, as the heavy loadings if placed on individual piers, would have required overlapping footings. Furthermore, on Canal street, the Illinois Tunnel Company operating narrow gauge freight subways, have tunnels and bye-passes at an elevation of about —40, which had to be bridged for such columns as were located over them.

Cylinder piers varied from four to ten feet in diameter and were carried down to hardpan, which in this territory is at elevation of —60 to —66 below river level. At the base, the piers are flared or "belled out," at an angle of two on one to afford a bearing of six tons per square foot on the hard pan. The caissons were constructed in the usual Chicago manner in soft blue clay, all wells being excavated in the open. After a depth of six feet to eight feet of excavation of required diameter is taken out, three inch tongued and grooved maple lagging is placed, and ¾ in. x 4 in. or ⅝ in. x 3 in., depending on size of caisson, wrought steel sustaining rings are placed to brace the lagging every three feet down the caisson. Another section of excavation is then taken out, lagging and rings installed and the operation repeated until hardpan is reached. It was usually possible to use eight-feet lengths of lagging at the top, but the depth of



TYPICAL SECTION - 18'0" SUBWAY

excavated section was reduced as the lower levels were reached, four-feet lengths of lagging being used near the bottom. When hardpan was reached, 1:1½:3 concrete was poured continuously to obtain a monolithic structure, the sustaining rings being removed as the well was filled and the lagging left in place. In constructing the caissons or



MAIL BUILDING FOUNDATIONS.

wells, each steam hoist operated rigs over about fifteen wells. Ropes from the hoisting engine wound around the "nigger head" or drum at the top of the well raised the spoil as the buckets were filled by the diggers. It took thirteen eight-hour shifts to excavate the smaller caissons, working only one digger. In caissons above 5 ft.-6 in. diameter, it was possible to use two men and in those above 8 ft. diameter four men could be worked. The concrete was placed in one eight-hour shift. The excavation taken from the wells was chuted through a temporary shaft to the Illinois Tunnel system below, whence it was taken to the lake front to be used for reclamation purposes. Caissons were poured from steel dump cars on narrow gauge tracks leading to a central mixing plant.

In placing the cast iron column bases, G. W. Allen, the superintendent, employed a simple and ingenious method of obtaining a perfectly grouted support securing uniform bearing on the concrete piers. Into the rim of the cast iron base were drilled four one-inch holes, after which soft steel tapered bushings for seven-eighths inch wrought iron threaded rods were inserted. Four 3-ft. supporting rods were then screwed through these holes projecting about fourteen inches below the cast iron base. The latter as now assembled was placed on the caisson, the four threaded rods supporting it. The caissons having been concreted to within about fourteen inches of the final elevation, the cast iron base was then raised or lowered as required by simply turning the threaded rods, and when

Retaining wall, station building.

Eighteen foot trucking subway.

at required elevation, the one to one grout was poured through the grouting holes in the cast iron base and an absolutely level bearing assured.

The mail building, 796 feet long by 75½ feet wide, seven stories above track level, and the 30-ft. driveway alongside, constructed between Harrison street and Van Buren street, are supported on 142 concrete cylinder piers varying from 4 ft. to 9 ft.-2 in. in diameter. The two 9 ft.-2 in. diameter piers carry columns supporting a 149 ft.-4½ in. truss, which alone weighs 364 tons, and which carries six building floors over a track entering the building at the west side. The photograph shows the excavation for the bell or footing of one of these caissons which have bases 25 ft.-6 in. in diameter, about the largest built by the Chicago method. Reinforced concrete girders, supported by concrete cylinder piers and cantilevered over the Illinois Tunnel system below, had also to be used in these foundations. The basement, 14 ft.-7 in. below top of rail, constitutes an important working floor, and is enclosed by concrete retaining walls heavily reinforced. 7500 tons of steel were used in the building and driveway, all of which is encased in concrete. 10,000 cubic yards of concrete were used in foundations and walls and 21,000 cubic yards in the superstructure. R. C. Wieboldt & Co. were the contractors for the building.

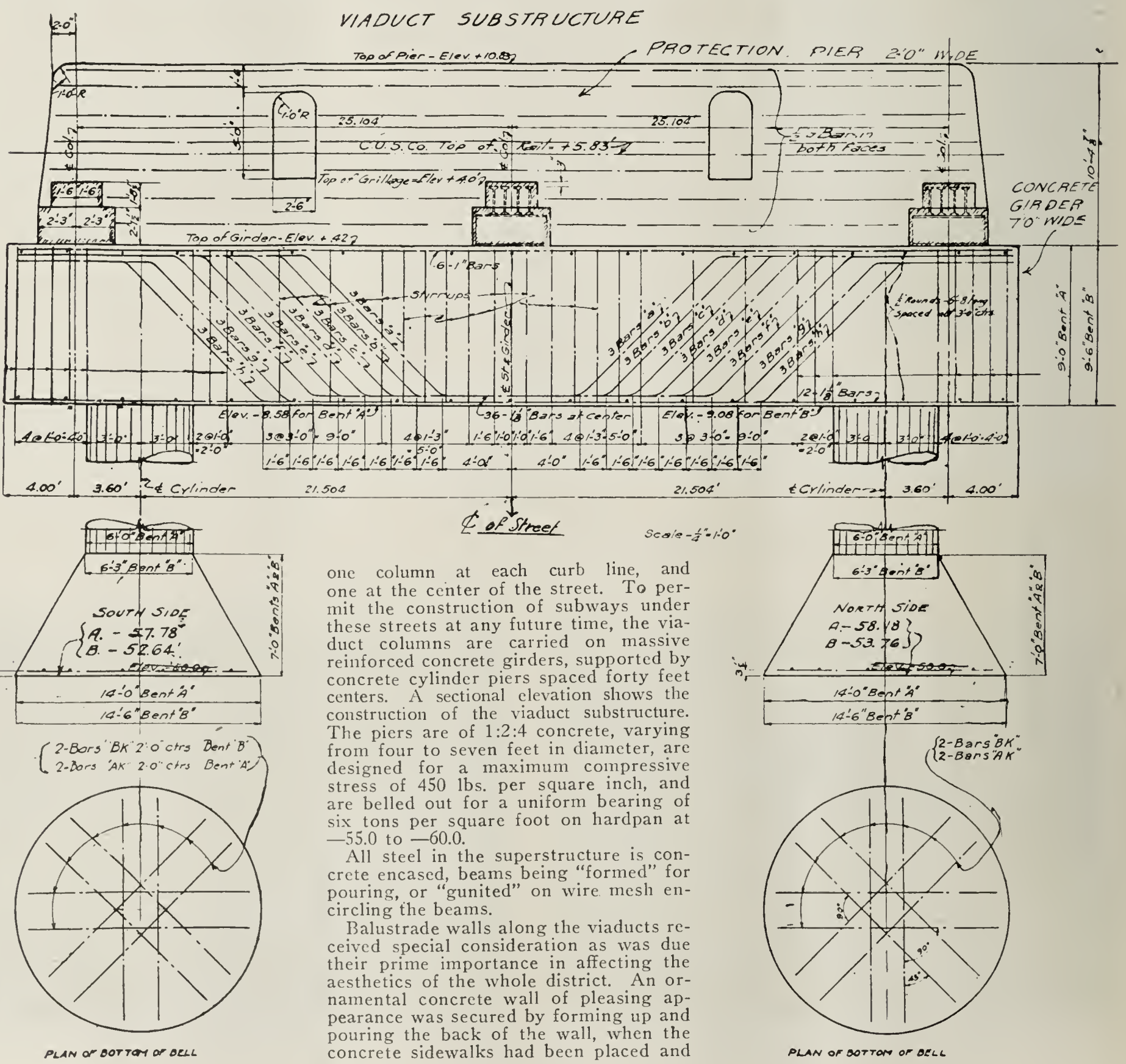
A trucking subway eighteen feet wide, ten feet high, extends from the mail building 580 feet to the basement of the concourse. This subway is of reinforced concrete and is designed for heaviest engine loading. Fig. 5 shows typical section of this subway and photograph shows the subway in course of construction. The subway is waterproofed with two-ply Karnak, the waterproofing being placed on the back sheeting of the trench as in the case of the station building curb walls, and then carried over the roof of the subway when the latter has been poured. Waterproofing is protected by two inches concrete at top and bottom and the sheeting left in place affords protection at the sides.

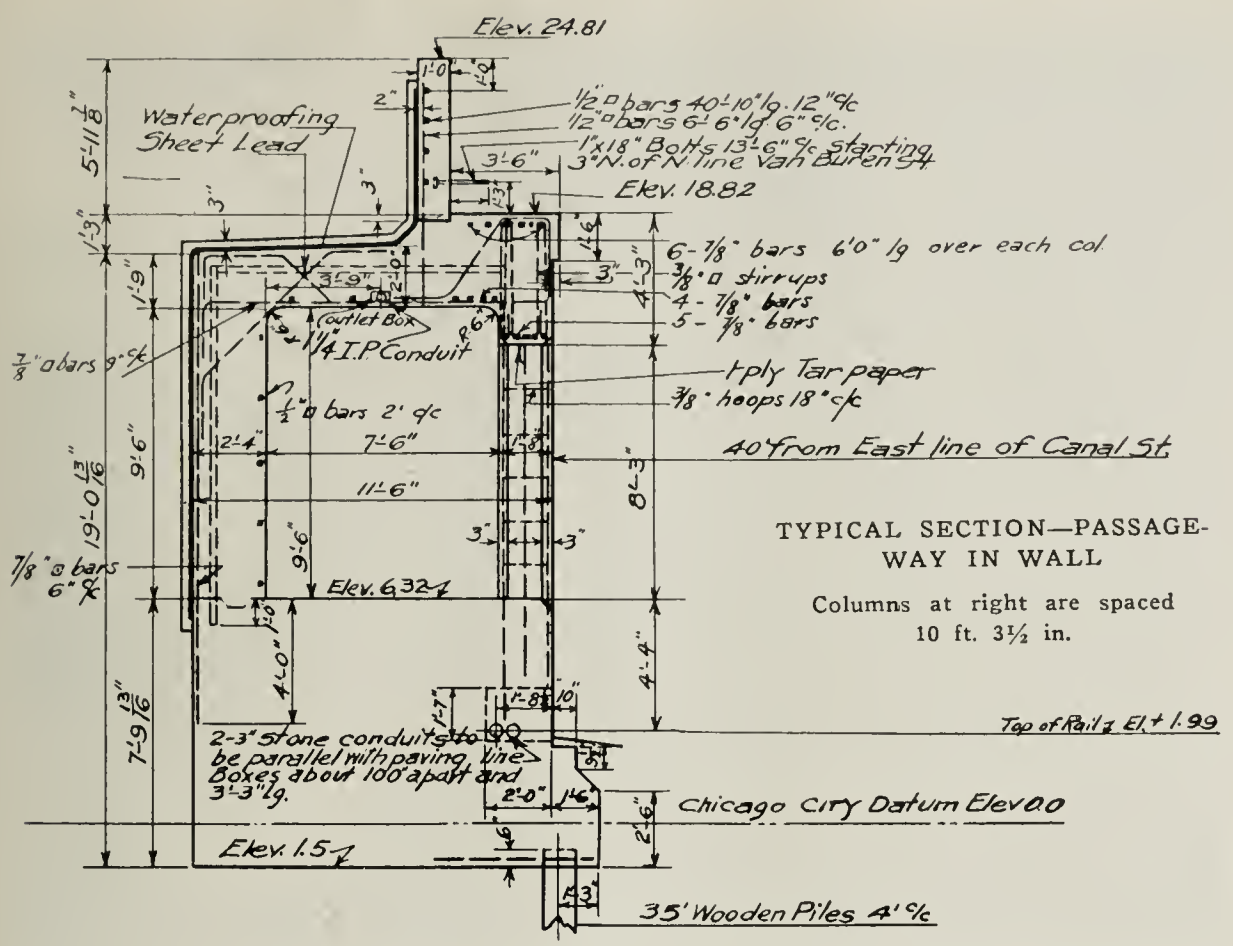
Eight of the twelve viaducts crossing the station company's property between Roosevelt road and Kinzie street, and varying from 220 to 1000 feet in length, and 66 to 80 feet in width, have been erected and put in service. These viaducts are supported on 3-column bents, one column at each curb line, and one at the center of the street. To permit the construction of subways under these streets at any future time, the viaduct columns are carried on massive reinforced concrete girders, supported by concrete cylinder piers spaced forty feet centers. A sectional elevation shows the construction of the viaduct substructure. The piers are of 1:2:4 concrete, varying from four to seven feet in diameter, are designed for a maximum compressive stress of 450 lbs. per square inch, and are belled out for a uniform bearing of six tons per square foot on hardpan at —55.0 to —60.0.

All steel in the superstructure is concrete encased, beams being "formed" for pouring, or "gunited" on wire mesh encircling the beams.

Balustrade walls along the viaducts received special consideration as was due their prime importance in affecting the aesthetics of the whole district. An ornamental concrete wall of pleasing appearance was secured by forming up and pouring the back of the wall, when the concrete sidewalks had been placed and the fascia girders had been encased. After forms had been removed, premoulded concrete sections were placed facing and "coping" the poured sections, resulting in solid panels alternating with partly open work, having members radiating from the center in "Union Jack" fashion.

The bridge across the river at Monroe street was constructed by the station company in return for streets vacated by the city and used by the station company. This bridge is of the trunnion bascule lift type, double leaf, 165 ft.-6 in. clear span. The concrete abutment piers were designed with bye-passes below the trunnion mechanism to provide for the river flow required by the Sanitary District. Concrete sub-piers were carried to rock about ninety-five feet below the river. Altogether there were fourteen sub-piers, the anchor sub-piers on the west side consisting of two ten-feet diameter concrete cylinders and on the east side two nine-feet diameter concrete cylinders. The two main river sub-piers on the west side are twelve-feet diameter and on the east side eleven-feet diameter. All of the foundations were constructed in the open, Fitz-Simons & Connell Dredge & Dock Com-




Elev. 24.81
Waterproofing Sheet Lead
1/2" □ bars 40'-10" lg. 12" c/c
1/2" □ bars 6'-6" lg 6" c/c.
1"x18" Bolts 13'-6" c/c starting 3" N. of N line Van Buren St
Elev. 18.82
6-7/8" bars 6'0" lg over each col
3/8" □ stirrups
4-7/8" bars
5-7/8" bars
Outlet Box
1 1/4 I.P. Conduit
1 ply Tar paper
3/8" hoops 18" c/c
7/8" □ bars 9" c/c
1/2" □ bars 2' c/c
40' from East line of Canal St.
7/8" □ bars 6" c/c
Elev. 6.32
2-3" Stone conduits to be parallel with paving line. Boxes about 100' apart and 3'-3" lg.
Top of Rail Elev. + 1.99
Chicago City Datum Elev. 0.0
Elev. 1.5
35' Wooden Piles 4' c/c

TYPICAL SECTION—PASSAGE-WAY IN WALL

Columns at right are spaced 10 ft. 3½ in.

pany being contractors for the substructure and the Ketler-Elliott Erection Company contractors for the steel erection. Total cost was $497,000.00 of which $181,000.00 was for the substructure, about 6200 cubic yards of concrete being used.

There are ten station tracks at the north end and fourteen station tracks at the south end, the Chicago, Milwaukee & St. Paul and the Panhandle (Penna.) railway trains using the north tracks, and the Pennsylvania system, C., B. & Q. railroad and the C. & A. railroad trains using the south track. Both yards will be served by six approach tracks from north and south.

In the construction of the station tracks, the station company adopted the most advanced practice in modern terminal design. Each rail is supported on 6-in. x 8-in. x 2-ft. 6-in. creosoted wood blocks, twenty to a 33-ft rail, laid in 1:1½:3 concrete, having tie plates 11-in. x7-in. x ¾-in. with 6½-in. spikes. The surface of the concrete has a floated sidewalk finish, sloped to drain to center of track. Below this encased track structure, a solid roadbed consisting of a ten-inch concrete slab, reinforced top and bottom with one-half inch and three-fourth inch rods, extends seven feet on each side of center line of track and also supports the curb wall of the baggage platform on one side, and the curb wall of the passenger platform on the other side. Baggage platforms are 10 ft.-9 in. wide, twenty inches above top of rail and passenger platforms 13 ft.-9½ in., seven and three-fourths inches above top of rail, both of reinforced concrete. The installation of special baggage platforms, another distinctive feature of this terminal, eliminates trucking on the passenger platforms, which is always of more or less inconvenience to passengers.

The station company, however, has not confined its use of concrete as a track substructure to its station tracks, as has been the usual practice, but in order to insure freedom from settlement and spewing up of subgrade material, has constructed its approach tracks on a concrete bed. This consists also of a ten-inch reinforced concrete slab, but instead of wood blocks and concrete encasement, as in the case of the station tracks, standard rock ballast and wood ties support the 130-lb. rails. While there are several instances of a concrete substructure in use for main tracks at track crossings and interlocking points, it is believed that this is the first case of its being adopted for main line roadbed, and its use has been fully justified. The approach tracks for the larger portion are at an elevation varying from 0 to four feet above, and within a short distance of, the river, and maintenance of the old track bed, was always a very expensive feature of operation. The new approach tracks need very little attention, and lining, surfacing and settlement troubles have been practically eliminated.

Excluding altogether the advantages of an exceptionally easy riding track, and based purely upon points of economics of construction and maintenance, the concrete substructure for these tracks has proved a good investment.

The track slab was laid on a 3-in. covering of cinders and in sections twenty-one feet long and thirteen feet wide, centered on track. Concrete was 1:2:4 mix, reinforced with wire mesh. After one section was poured the next section was left for the moment, and the concreting proceeded with on the section ahead. Afterwards, the alternating sections were filled in, three-ply roofing paper being inserted as an expansion joint between sections. Cement and aggregate were unloaded as near as possible to the work in progress, and the mixer moved forward with the construction of the slab. The approach tracks when completed will require about 310,000 square feet of concrete slab.

An elaborate system of sub-drainage is provided. Cross drains with small concrete catch basins between tracks intersect the roadbed every eighty-eight feet and connect with cast iron mains which are carried to concrete sumps, one

Approach tracks on concrete slabs before ballasting.

at Van Buren street for the south tracks. and one at Madison street for the north tracks.

A power plant furnishing steam and compressed air to the mail building, station building and other units of the company has been erected at Canal street north of Harrison street. This building is of steel and brick and the building with its 175 feet circular brick stack has had special architectural treatment in order to secure a well favored structure in harmony with the adjacent works of the station company. This building also is carried on concrete cylinder piers. Its equipment includes two 610 H. P. and two 328 H. P. Sterling boilers.

A terminal project of this magnitude involves a great interlocking and signal system, and the station company has extended its use of concrete to this field, all of the cables for interlocking being laid in premoulded concrete trunking of box section, having tight fitting cover sloping to each side to shed water and prevent its use as a walkway.

The trunking is cast in steel forms eight feet lengths, 1:1½:1½ mix, all sides one and one-half inches thick, reinforced with one-fourth inch bars and wire mesh. Inside dimensions are nine inches wide by eight inches deep, with a capacity for about 500 No. 14 A. W. G. insulated wires. Top of trunking is 6⅛-in. above top of rail, 12-in. square concrete pedestals eight feet apart being used for supports. Total length of trunking will approximate 9000 lineal feet. In the train shed and concourse sections where trunking connot be used, the cables will be carried in fourteen 3½-in. fibre conduits encased in concrete.

Most of the sewer changes had to be made when work on the project was begun. All of the four-feet and five-feet main sewers in the streets west of the river between Roosevelt road and Kinzie street flow east towards the river, and due to the lowering of the tracks between these streets, it was necessary to build new reinforced concrete sewers 3 ft.-6 in. x 4 ft.-6 in. in Polk street, and 4 ft.-4 in. x 5 ft.-6 in. in Taylor street. A new brick sewer running along Canal street from Jackson boulevard to Harrison street was built, intercepting the main sewers between these streets and was thence continued east of reinforced concrete 4 ft.-6 in. x 6 ft. along Harrison street under the tracks to the river. A 9-ft. x 12-ft. reinforced concrete sewer was constructed between Adams street and Washington street, discharging into the river at Washington street and also intercepting the sewers from the west. From Randolph street a brick sewer was constructed running north along Canal street to Fulton street, thence continuing east of reinforced concrete, 4 ft.-6 in. x 6 ft. to the river.

Sewers under tracks are of U-shape section, semi-circular invert, vertical sides and flat top, their heights being restricted by the low elevation of tracks with reference to river level.

The viaduct of the Metropolitan elevated railway which crosses the station company's property north of Van Buren street is being reconstructed as a half through structure, the cylinder sub-piers having been completed. The old stone piers are now placed diagonally to the proposed track and platform layout, which will be parallel to Canal street, and their removal and substitution by columns parallel with the tracks was essential to the station company's plan. The present floor system will be utilized in the new structure. Erection of the Roosevelt road viaduct, 1060 feet long x 118 feet wide, is also being put under way. Construction of the Adams street and Jackson boulevard viaducts is governed to a large extent by operations on the main building and concourse, and the necessity at all times of affording access to existing terminal facilities at the present station north of Adams street and the temporary suburban station south of Jackson boulevard. A viaduct which will convert North Canal street into a two-level thoroughfare from Fulton street to Kinzie street has also to be built by the station company, and a double deck bridge crossing the river at Kinzie street has yet to be constructed, although a large amount of construction on the approaches to the bridge from the east has been completed by the station company.

Caisson base, 25 ft. 6 in. diameter, at hard pan, main building

The total cost of the station company's project will be $60,000,000, of which $48,500,000 has been expended to date. With the track work and grading now so far advanced, it is expected to have the new station in operation in the fall of 1924.

E. E. Stetson has charge of all field operations. E. Weidemann has charge of design, C. J. Noland of tracks and track structures and Thos. Holt of signals and interlocking. Graham, Anderson, Probst & White are architects for all station buildings.

J. D'Esposito, Chief Engineer of the station company, has executive direction and supervision of all design and construction. The writer is Assistant to the Chief Engineer.

Cement in Reclamation Service

WASHINGTON, MAY 26.—The Reclamation Service of the Department of the Interior has used over 3,000,000 barrels of cement, and has manufactured over 1,500,000 barrels of cement and sand-cement, according to a summary of its work during the past twenty years issued by the department.

The water storage capacity of irrigation project reservoirs has now reached 10,000,000 acre-feet, or enough to cover the entire state of Connecticut with three feet of water.

The number of projects now under way or completed embrace upwards of 3,000,000 acres of land that may ultimately be irrigated, divided into 70,000 farms ranging from ten to 160 acres.

The construction of reclamation projects representing a storage capacity of 10,000,000 acre-feet of water has included over 12,500 miles of canals, ditches and drains; tunnels with an aggregate length of over twenty-seven miles; masonry, earth, rock-fill and crib dams with a total volume of 14,000,000 cubic yards; over 8,000 bridges, 560 miles of pipe line, 130 miles of flumes, a thousand miles of wagon road, 83 miles of railroads, 3,000 miles of telephone lines, 970 miles of transmission lines, and 1,450 buildings such as offices, residences, power plants, pumping stations, barns, and storehouses. The excavation of rock and earth amounts to about 200,000,000 cubic yards, equivalent to an excavation one mile on a side and nearly 200 feet deep. Excavation during 1922 exceeded a million cubic yards a month.

The program of the Fifth Annual Convention of the National Lime Association to be held at the Hotel Commodore, New York City, under date of June 13, 14 and 15 has been issued. The convention will be almost exclusively an executive session and the program is divided into these general heads: Wednesday, June 13, the executive session, Thursday, June 14, open session. General reports of the departments. manufacturing subjects, lime in highways, lime partition block, quick setting lime plaster. On Friday, June 15, there will be another executive session.

The J. P. Gilman Granite Company, J. E. Wilson, Commerce Bldg., Kansas City, Mo. is president, has been incorporated with a capital of $30,000 by J. E. Wilson and others.

Some Comparisons of Concrete with Clay Brick Masonry*

Recent Developments Show Superiorities in Concrete Brick Masonry. Authoritative Tests Gratifying to Concrete Brick Manufacturers

By A. J. R. Curtis

For four thousand years or more clay brick have been made and used in masonry. The fact that most clay brick walls stood up—and only a relatively few collapsed—until recently has been proof sufficient of acceptable quality. Now come concrete block and concrete brick to contend for the patronage of the building public. They are, in a sense, new. Where concrete brick have been demonstrated to be exact counterparts of the clay brick in load bearing ability and absorption, the former have had easy sailing because superficial judges have assumed that if similarly laid they would produce masonry practically identical in physical characteristics to that produced with clay brick.

It is a fact well known to leading engineers that the strength of masonry is primarily dependent upon three factors:

(1) The strength of the individual units, (2) The strength of the mortar. (3) The tenacity with which the units and the mortar adhere.

Clay men have been loath to admit the significance of the last factor particularly—for it holds one of the keys to the superiority of concrete brick and concrete block masonry. It is a fact that concrete units individually *weaker* than corresponding clay units, when laid up in identical mortar and treated throughout in the same manner, produce *as strong or even stronger* masonry. Put in reverse language, concrete brick of equal strength to clay brick produce stronger masonry.

The Columbia University Studies

These facts were first brought out significantly in several series of commercial tests made at Columbia University, New York City, for certain brick manufacturers. The phenomena appeared so interesting and so likely to lead to valuable results that Professor A. H. Beyer, well known director of testing and research, in the College of Civil Engineering at Columbia and Professor William J. Krefeld of the same college, have lately devoted several months time to a thorough and scientific comparison of the *characteristics* of clay and concrete brick masonry.

It is safe to say that this investigation is the most exhaustive of its kind ever attempted. The conclusions were reached from the results of tests on 135 masonry piers twelve inches square, 115 of which were forty inches high and the remaining twenty of which were eighty-four inches high. Forty-four piers were of clay masonry, seventy-nine piers were of concrete brick masonry, eight were constructed with sand-lime brick and four were of monolithic concrete.

All of the piers were constructed in the laboratories at Columbia by experienced but disinterested bricklayers who were unaware of the use for which the piers were intended and therefore probably performed their work with average efficiency. The brick were intended to be representative of the commercial product used in New York City, and all of the piers were laid in cement mortar, which is prescribed and required by New York building codes. Further details of the tests are given in full in Columbia University Bulletin No. 12 entitled "Comparative Tests of Clay, Sand-Lime and Concrete Brick Masonry."

New York Department Cooperates

For obvious reasons these studies were conducted entirely without the cooperation of manufacturers in order that no suspicion of partiality might attach to whatever results were obtained. In order to make sure that the studies would have proper local bearing, and would follow along such lines that they could be conveniently interpreted by building officials and structural engineers dealing with related problems, the University asked and secured official and *actual* cooperation of the Bureau of Buildings of the City of New York. Representatives of the New York building department selected the materials tested and in some cases inspected their manufacture, and they witnessed the construction and testing of many of the piers. Although financed entirely by Columbia University these tests represent the joint efforts of one of our greatest scientific institutions with the greatest building department—it is safe to say—in the world. The results are therefore beyond question and in supporting the righteous cause of concrete brick they carry with them the most deadly scientific blow clay brick and clay products generally have ever received.

***Mr. Curtis' article is largely an exposition of subject matter covered in Scientific Paper No. 12, just issued by the Department of Civil Engineering, Columbia University, entitled "Comparative Tests of Clay, Sand-Lime and Concrete Brick Masonry."**

A Comparison of Clay and Concrete Efficiency

Let us consider first the comparison of bearing ability between clay and concrete brick piers included in the test. The comparison is clearly shown in the following table which represents averages for all of the tests made on masonry thirty days old:

Ultimate Compressive Strength of brick in lbs. per sq. in.	Ultimate Compressive Strength of pier in lbs. per sq. in. Concrete Brick Series A	Concrete Brick Series B and C	Clay Brick Series A	Clay Brick Series B and C
1500	1210	1070	.....	.....
2000	1490	1320	850	490
3000	1970	1760	1270	740
4000	2450	2170	1700	980
5000	.....	.....	2120	1220

Note that so far as bearing ability is concerned, concrete brick which had an individual strength of 1500 pounds to the square inch produced masonry of strength approximately equal to that produced by clay brick which would average 3000 pounds per square inch on individual tests, and that 5000 pound clay brick hardly exceeded 3000 pound concrete brick.

Figure 1—The failures of the concrete brick piers resembled those of monolithic concrete, practically all of them failing in diagonal shear. This proves that the bond between mortar and cement bricks is so effective that it produces monolithic action in the pier.

These results are so outstanding as to raise the question immediately as to the effect of time upon them. The contender for clay brick may ask whether the significance of the comparison is more pronounced when the masonry is thirty days than later on. In answer, Professor Beyer found that for clay brick piers there was an average increase in strength of thirteen per cent in the period from thirty days to ninety days, while in the case of the concrete brick the corresponding gain was found to be 15.8 per cent.

It will be noted that in the tests results tabulated above the ratio of the strength of the piers to that of the concrete brick ranged from about forty-three per cent to ninety-five per cent, while a similar tabulation of results of tests on comparable concrete brick piers eighty-four inches long shows that the same ratio reached 97.8 per cent. How do the results of the corresponding tests on the clay brick piers compare?

RATIO OF THE STRENGTH OF MASONRY PIERS TO THE STRENGTH OF INDIVIDUAL UNITS

Piers of Concrete Brick, 40 inches long.

Pier	1. Average compressive strength of pier (In pounds per sq. in.)	2. Average compressive strength of units	3. Efficiency ratio (1)÷(2)
1	1030	1383	.745
2	1318	1388	.950
3	1784	2678	.666
4	1955	2610	.749
5	1490	1923	.775
6	1647	1892	.871
7	1806	2545	.710
8	2159	2529	.854
9	1569	2462	.637
10	2008	2508	.801
11	1346	1853	.726
12	1840	3446	.534
13	2032	4704	.432
14	2167	4086	.530
15	1649	2544	.648
16	1992	3598	.554
17	1610	2329	.691
18	1136	1827	.622
19	1568	2737	.573
20	1262	2056	.614
21	1066	1500	.711
22	1982	3176	.624
23	846	1150	.736

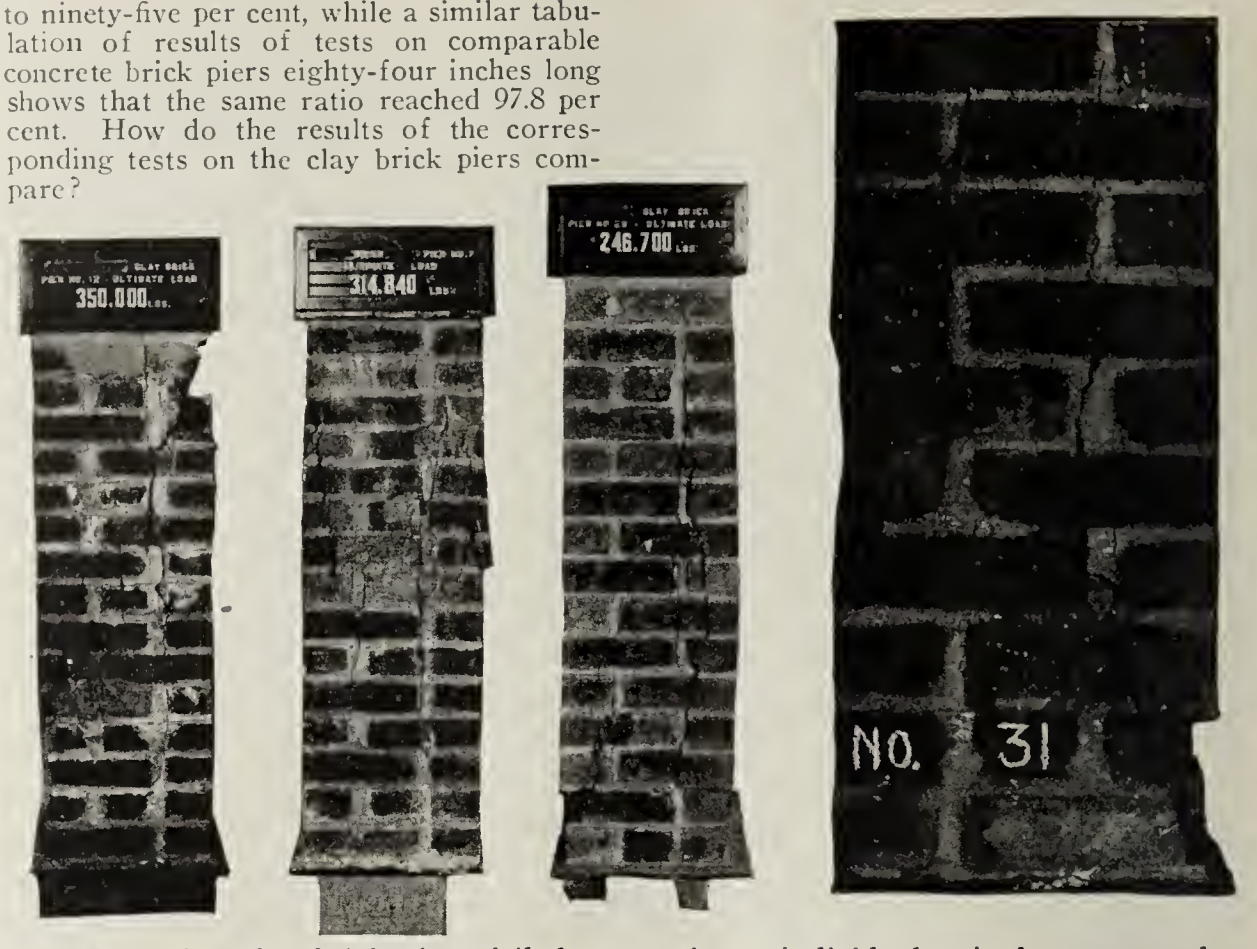


Figure 3—The clay brick piers failed not as in an individual unit, but appeared to indicate a progressive disintegration of individual bricks and of the mortar between them.

The highest efficiency ratio obtained for the clay brick piers forty inches long was therefore 55.4 per cent as against 95 per cent noted above for the concrete brick piers, while the lowest ratio for the forty inch clay brick piers was 22.3 per cent as against 43 per cent for the concrete. A similar test on clay brick piers eighty-four inches long gave ratios varying from 31.9 per cent to 48.2 per cent. In these studies all variable elements have been carefully noted and compensated for wherever necessary.

Conclusions Far Reaching

As a result of these studies, confirming and connecting up earlier investigations in these interesting fields, the facts must soon be accepted generally that (1) Concrete brick give much stronger masonry for a given strength of brick than do clay brick; or, interpreted for the engineer or designer, masonry of any required strength can be obtained by the use of concrete brick which develop considerably less unit strength than that required of clay brick if the latter are used, and (2) The superior bonding characteristics, so well proven in the case of concrete brick, also hold for concrete block, concrete building tile and other concrete building units laid in mortar; in fact it seems likely that even better results might be obtained with the larger concrete units such as block, which, being heavier, might be expected to seat more efficiently and bond more firmly with the mortar. In that connection the following resume of a recent comparative efficiency test on concrete and clay tile masonry will be of interest:

The above tests indicate that clay tile have bonding characteristics similar to those of clay brick, and very much inferior to those of concrete building units.

RATIO OF THE STRENGTH OF MASONRY PIERS TO THE STRENGTH OF INDIVIDUAL UNITS

Piers of Clay Brick 40 inches long.

Pier	1. Average compressive strength of pier (In pounds per sq. in.)	2. Average compressive strength of units	3. Efficiency ratio (1)÷(3)
1	1409	3245	.434
2	1538	3245	.474
3	2187	4460	.490
4	2473	4460	.554
5	1475	3450	.428
6	1690	3450	.490
7	1841	5010	.367
8	2136	5010	.426
9	966	3577	.270
10	1307	5592	.234
11	628	2819	.223
12	1165	4584	.254

TESTS MADE ON CLAY AND CONCRETE TILE WALLS BY THE STRUCTURAL MATERIALS RESEARCH LABORATORY, LEWIS INSTITUTE, CHICAGO

(All Tile Laid in 1:3 Portland Cement Mortar)

Wall No.	Kind of Tile	Dimensions of Wall Section in inches Width	Length (in inches)	Height	Average Compressive Strength of Individual tile in lbs. per sq. in. of gross area	Average Compressive Strength of wall in lbs. per sq. in. of gross area	Efficiency of Wall Section as compared with individual unit
1	Concrete	8.0	24.0	15.2	1350	670	50%
2	Concrete	7.9	24.5	15.2	1350	740	55%
3	Concrete	11.9	16.0	15.3	1350	800	59%
4	Concrete	11.9	12.0	15.5	1350	1080	80%
5	Concrete	7.9	12.0	15.5	1350	1040	77%
					Average efficiency of concrete tile masonry:		64.2%
6	Clay	8.4	26.4	17.0	630	120	19%
7	Clay	8.4	26.4	15.9	630	170	27%
					Average efficiency of clay tile masonry:		23%

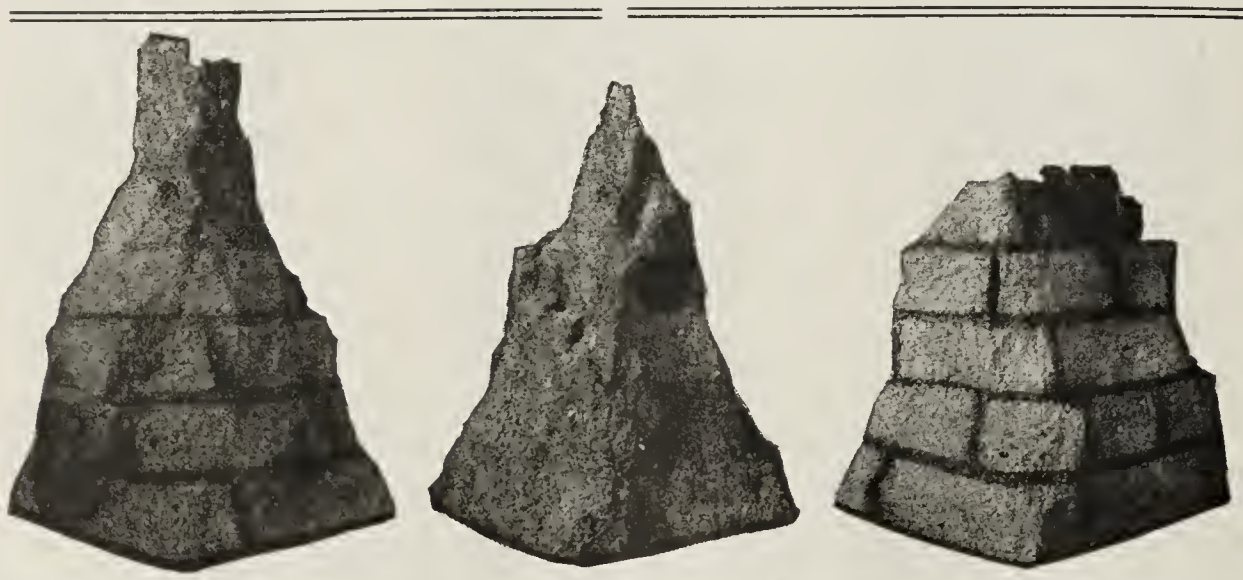


Figure 2—Close-up views of several typical fractures of concrete brick piers show them to be characteristically cone-shaped, very closely resembling those of homeogeneous building stones, both natural and artificial. Every bit of the strength of individual brick is made available for load bearing.

TABLE 2
Tests on (Clay) Brick Piers at Watertown Arsenal, U. S. Ordnance Department

Brick Used	Age Mos.	Age Days	Ultimate strength lb. per sq. in. Pier	Brick	*Per Cent Efficiency
Light, hard, sand struck	2	12	900	.....	.....
Hard, water struck	5	22	3,422	12,880	26.6
Light, hard, water struck	5	5	1,565	5,828	26.9
Hard, sand struck	1	0	1,800	11,340	15.9
Light hard, sand struck	6	0	1,519	6,598	23.0
Hard, sand struck	6	0	1,800	5,248	34.3
Light, hard, sand struck	6	0	1,224	4,474	27.4
Hard, sand struck	6	0	1,411	5,808	24.3

Average 1,705 lbs. per sq. in.

TABLE 3
Tests on Large (Clay) Brick Piers, U. S. Bureau of Standards.
(Age of brickwork one month in all cases)

Brick Used	No. of Tests	Ultimate Strength lbs. per sq. inch Brickwork	Brick	Per cent Efficiency
Pittsburgh District	3	1,647	6,070	27.2
Pittsburgh District	3	1,463	6,070	24.1
New Orleans District	2	1,710	6,880	24.9
New York District	3	1,260	4,430	28.3
Chicago District	3	720	3,150	22.9
Pittsburgh District	2	1,785	2,450	70.3

Average 1,391 lbs. per sq. in.

TABLE 5
Tests on (Clay) Brick Piers at Stockholm, Sweden
[Representing a Swedish, not an American Product]

Mortar Mixture Cement	Lime	Sand	Piers	Crushing strength pounds per sq. in. Brick	Mortar	*Per Cent Efficiency
1.00	0.00	3.00	1,980	4,040	2,620	49.0
0.43	0.85	3.00	1,930	4,040	1,640	47.1
0.67	0.33	3.00	1,700	4,040	1,280	42.1
0.50	0.50	3.00	1,840	4,040	695	45.5
0.33	0.67	3.00	1,420	4,040	355	35.1

TABLE 6
Tests on (Clay) Brick Piers at University of Illinois
By A. N. Talbot and D. A. Abrams

Brick	Brickwork	No. of Tests	Age Days	Strength lbs. per sq. in.	Efficiency Per Cent Brick	Mortar
Shale	Well laid	3	67	3,365	31	117
Shale	Well laid	2	181	3,950	37	.....
Shale	Poorly laid	2	68	2,920	27	105
Clay	Well laid	2	62	1,060	27	37

(In the above tables columns marked * were added in order to indicate at a glance the ratio between the strength of the masonry and that of the brick.)

It will be acknowledged everywhere that Columbia University is a strictly non-partisan and unprejudiced source of information and that the New York Bureau of Buildings is not only the largest and one of the best conducted building departments in existence but also that it is one of the most capable. Fifty story buildings go up in accordance with its regulations and every minute calculation for such structures is reviewed by its experts. So the Columbia tests must be accepted as the most authentic and certainly the most exhaustive investigations on the efficiency of brick masonry which have yet appeared.

But the question naturally arises as to the relation of these tests to those now used by the promoters of clay brick. In a circular recently issued by the Common Brick Manufacturers Association (Clay) entitled "The Strength of Ordinary Brickwork" all of tables shown on this page appear, apparently including about all of the significant data on the subject.

Even reinforcing of various kinds, tried experimentally, gave few beneficial results as far as clay brick efficiency is concerned, as the following table from the literature quoted above will show:

Figure 4—Detail pictures of the clay brick failures prove beyond a doubt that the units broke from the mortar being unable to develop in masonry anything like their own individual strength.

TABLE 9
Effect of Various Types of Mortar Joint Upon the Efficiency of (Clay) Brickwork as Related to Strength of Individual Brick.

Place of tests	Kind of Joints	No. of Tests	Average ultimate Strength Brickw'k	Brick	Per Cent Efficiency
Bureau of Standards, Pittsburgh	1:3 Portland cement mortar	3	1,647	6,070	27.2
do	1:3 Portland cement mortar in which 15% of cement was replaced by lime	13	1,332	4,584	29.1
do	do. with 18 gage No. 2 galv. iron wire mesh in every joint	1	2,270	2,450	92.7
do	do. in every fourth joint	1	1,470	2,450	60.0
Cornell University	1:2 Portland cement mortar	2	1,167	.....	30.0
do	do. wire mesh in every course	2	1,567	.....	46.0
do	do. wire mesh in every 2nd course	2	1,192	.....	33.0
do	do. iron plate every 4th course	4	1,002	.....	28.0
do	do. iron straps every 4th course	2	865	.....	24.0
do	do. iron straps every 6th course	1	780	.....	22.0
do	do. iron straps every 8th course	1	843	.....	24.0

Nor can the low efficiency factors obtained in the foregoing data be successfully contradicted; the article entitled "The Strength of Ordinary Brickwork" which constitutes the substance of the circular referred to, and of which the tables quoted are a part, was prepared by Rudolph P. Miller, president of the Building Officials Conference and until recently superintendent buildings, Borough of Manhattan. Mr. Miller is known and accepted everywhere as a leading authority. The data presented by the clay brick manufacturers therefore admit the superior efficiency of concrete brick, and are really more favorable to clay brick than the recent comparative tests at Columbia quoted earlier in this article.

Not the Only Advantage

Concrete brick possesses several other equally outstanding advantages over its clay rival, as clearly revealed by the Columbia tests. For example, a comparative study of the effect of height of pier on the compressive strength show that at both thirty days and ninety days the strength of clay brick piers was materially reduced when the length was increased from forty inches to eighty-four inches. A similar comparison for concrete brick piers shows that there was no appreciable loss in strength when the pier length was increased from forty inches to eighty-four inches. The following tables present the facts in condensed and easily assimilated form:

FOR CLAY BRICK

Height of Pier in Inches	Ratio of Compressive Strength of Pier to Brick 30 Days	90 Days
40	0.424	0.48
84	0.38	0.43
Ratio 84:40	0.90	0.90

FOR CONCRETE BRICK

Height of Pier in Inches	Compressive Strength of Pier in Terms of Compressive Strength of Brick, lbs. per sq. inch 30 Days	90 Days
40	$6.22\ B^{.72}$	$7.2\ B^{.72}$
84	$6.22\ B^{.72}$	$7.2\ B^{.72}$
Ratio 84:40	1.00	1.00

The formula used in the lower table related to the relation between the compressive strength of the pier and the compressive strength of individual concrete brick, varying as will be noted, with the age of the masonry.

Higher Modulus of Elasticity

So far as the writer is aware, the Columbia investigations are the first to point out and demonstrate the higher elastic limits of concrete brick masonry. Previous comparisons have all been made from the standpoint of compressive strength, but as Professor Beyer very aptly points out, "Compressive strength comparisons do not necessarily indicate the relative elastic strengths unless similar materials are compared."

It was found in this series of tests that for both clay and sand-lime brick piers the ratio of the elastic limit to the com-

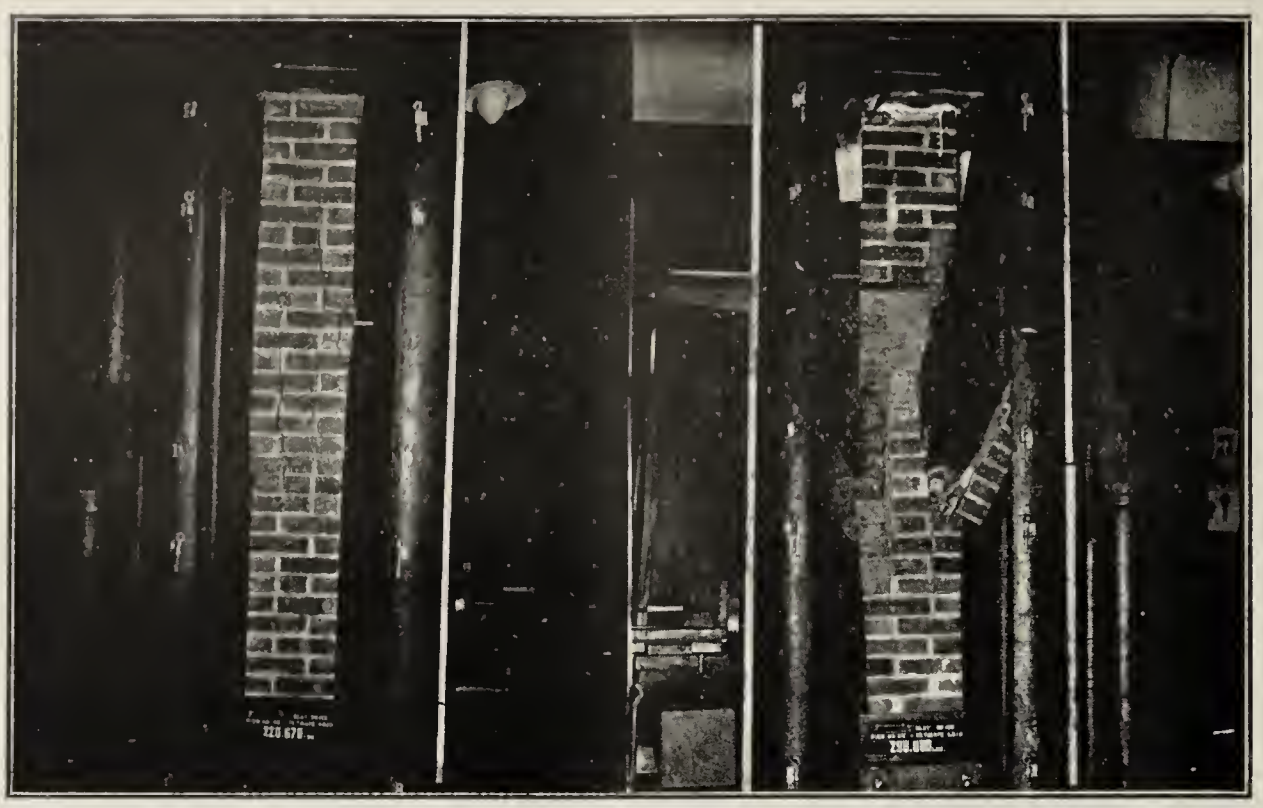


Figure 5—Clay brick piers 84 in. high carried 90 per cent of the load carried by similar piers 40 in. high. The increase in length of concrete brick piers did not reduce their load-carrying capacity *at all.* The poorer showing made by the clay pier was due to vertical cracking which divided the original column into nine columns of same length and one-ninth of the cross section.

pressive strength was .47 while for the concrete piers the ratio was .57. The manner of the failure, as shown in accompanying illustrations, undoubtedly offers an explanation for the higher figures as units at relatively high stresses while the clay and sand-lime piers failed in detail these detail failures starting at relatively low stresses. The following table will indicate that the elastic limit of masonry composed of 1500 pound concrete units is considerably higher than the elastic limit of masonry composed of 3000 pound clay units; similar masonry of 2000 pound concrete units exceeds masonry of 4000 pound clay units.

COMPARISON OF ELASTIC LIMITS OF CONCRETE AND CLAY MASONRY

Ultimate Compressive Strength of Brick, lbs. per sq. inch	Elastic Limit of Masonry, lbs. per sq. in. Concrete Series A	Clay & Sand-lime Series A
1500	690	.....
2000	840	.....
3000	1120	590
4000	1390	800
5000	.....	990

What About Relative Stability?

The Columbia University tests did not go into the relative stability of concrete and clay brick walls, or doubtless many impressive and useful facts would have been added to the wealth of important disclosures already described.

It may be interesting in this connection, however, to glance over recent British tests, made by the Department of Scientific and Industrial Research of the British government, covering the stability of walls of clay brick, concrete and concrete block. In these tests we find the horizontal pull required to break the given wall of clay brick ranged from 375 pounds to 895 pounds while for a monolithic concrete wall the corresponding figure was 1262 pounds and for a wall of standard quality concrete block, 1253 pounds.

TABLE OF RESULTS OF EXPERIMENTS ON STRENGTH OF THIN WALLS

	Description	Crushing strength of cube, lbs. per sq. inch	Age of Cube when tested, days	Crushing strength of wall 14 in. wide by 8 ft. 6 in. high, lbs. per sq. inch	Age of Wall when tested, days	Horizontal pull to break wall 3 ft. 6 in. wide by 8 ft. 6 in. high under vertical load of 1 ton per lin. foot, lbs.	Age of wall when tested under horizontal pull, days
1	*Stock bricks 3 to 1 cement mortar, wall 4½ in. thick	770	26	638	24	895	34
	*(In the above specimen a vertical load of 2 tons per lineal foot was applied for the horizontal pull test.)						
2	Ditto, 6 to 1 cement mortar	720	26	562	23	791	41
3	Fletton bricks, 3 to 1 cement mortar, wall 4½ in. thick	1,530	26	1,040	24	781	39
4	Ditto, 6 to 1 cement mortar, wall 4½ in. thick	1,250	26	930	23	705	36
5	Ditto, 3 to 1 lime mortar, wall 4½ in. thick	1,050	22	330	24	375	27
6	Ditto, on edge, 3 to 1 cement mortar, wall 2⅝ in. thick	1,470	29	1,040	23	553	44
7	Concrete 1:2:4, wall 4½ in. thick, cast in one piece	(1,480 (2,250	22) 42)	1,230	26	1,262	27
8	Concrete blocks, 1:2:4, set in 3 to 1 cement mortar, wall 4½ in. thick (blocks, 14 in. x 9 in. x 4½ in.)	(1,480 (1,250	22) 42)	1,510	22	1,253	25
9	Concrete blocks, (Winget, 1:2:4), wall 4½ in. thick (blocks 6 in. x 6 in. x 4½ in.)	743*	120	580	24	962	44
10	Concrete blocks, 1:2:4 (wet process), wall 3 in. thick (Blks. 6 in. x 6 in. x 3 in.)	(1,630* (1,240*	29) 29)	1,130	24	700	32
11	Coke breeze blocks, wall 3 in. thick (blocks 6 in. x 6 in. x 3 in.)	236	unknown	170	22	467 (slab)	41
12	Coke breeze blocks, wall 4 in. thick (blocks 6 in. x 6 in. x 4 in.)	243*	unknown	173	22	658 (slab)	41

*These specimens were cut from a larger block as true as possible but not faced, and no doubt were really stronger than the tests indicate.

From the foregoing it is evident that considered from every structural viewpoint—load bearing ability, stability and other considerations—concrete building units have been definitely proven the superior of clay units. Practical experience is bearing out this fact daily and its quite general acceptance among well informed engineers and designers accounts to some extent for the recent phenominal gains made by the concrete structural products.

Comminution

Less than thirty-five years ago, all cement mills ground both their raw materials and clinker with old-fashioned millstones. One of these flat, circular stones was placed on another, rotated, and the materials ground between, much as the old-time Indian squaw ground her grain. It was a primitive method but it served very well, for the demand for cement was small—less than one-half of one per cent of what it is today.

Then the demand grew—and a problem confronted cement manufacturers. They realized that they might soon be called on to grind many thousand tons of materials a day.

How well the problem was solved is shown by the remarkable array of crushing and grinding machinery in any cement plant today.

Remarkable Machines

As many people know, the materials going into cement must be ground not once but several times. Great rocks from the quarry must be crushed into smaller sizes, these must be reduced to the fineness of sand, and the sand-like particles must be ground finer than flour. Then this "raw mix" is burned to glass-hard clinker, ranging in size from peas to walnuts, and the clinker in turn is ground finer than flour.

For these different crushing and grinding operations, the manufacturer today has the choice of a variety of machinery.

You may see first a steel lined pit, sixteen feet across the top, looking like a huge inverted bell with upright clapper. That is a gyratory crusher. Slowly, steadily, the great clapper travels a circular path—crushing big rocks to small fragments. A large gyratory crusher may weigh 60,000 pounds—and crush 1,000 tons of rock an hour.

After that you may see hammer mills, in which a hundred hammers swinging on hinges batter the rock into sand-like particles.

Crushed With Steel Balls

Then there are ball mills—armor plated cylinders the size of locomotive boilers, partly filled with tons of steel balls from three to five inches in diameter. As these cylinders revolve the balls climb the sides, falling and crushing the small stones to fine particles.

At some plants, centrifugal mills are used, where the materials are crushed by steel rollers. Jaw crushers with an insatiable appetite for hard stone, revolving discs, rolling cylinders—every possible means of breaking and crushing rock is brought into action at some point or other.

Finer grinding of the clinker is usually done in tube mills where steel balls from ⅞ to 1¼ inches in diameter reduce the hard pellets to finished cement.

Last year approximately 35,000,000 tons of raw materials, 22,000,000 tons of clinker and 8,500,000 tons of coal were pulverized in cement mills—two tons or thereabouts for every ton of delivered cement.

The wear and tear on the crushing and grinding machinery is the principal reason why one out of every five employes in a cement plant is engaged on repair work.

"Transit" Cement Not Commercial Necessity

Interstate Commerce Commission Rules That the Establishment of Transit Arrangements at Davenport, Iowa, Are Not Justified

WASHINGTON, D. C., MAY 28.—The Interstate Commerce Commission has found unlawful a proposed transit arrangement on cement at Davenport, Iowa. The commission has ordered canceled a schedule filed by the Chicago, Rock Island & Pacific Railway. The schedule was to have become effective on January 15, 1923, but was suspended until June 14 upon the protest of the Western States Portland Cement Company and the Lehigh Portland Cement Company.

The proposed transit arrangement provided that cement might be stored, sacked and reshipped from Davenport within six months at a charge of 2.5 cents per 100 pounds over the through rate. The transit would be permitted whenever Davenport is intermediate between the point of origin and final destination, the movement both inbound to Davenport and outbound from that point to be over the Rock Island line.

No transit arrangements on cement have heretofore been established, it being the general practice to ship direct from the mill to the consumer. The Marquette Cement Manufacturing Company, which has a warehouse at Davenport, urged the establishment of the proposed transit arrangement on the ground that a large part of the year's production must be milled during the eight months' period from April to November and approximately forty per cent of the entire year's production may be called for during August, September and October. This company, which has a mill at La Salle, Ill., stated that it has been compelled to limit its production to the available transportation during the open season for construction work, and that for many years because of the recurring shortage of cars at the mill during the season of greatest demand for cement the output of the mill has been restricted by inadequate car supply, and that as a means of relief from this situation it has in course of construction in Davenport a storage warehouse with a capacity of 200,000 barrels of cement and which will represent an investment of $150,000. It was pointed out that at Davenport the inbound tonnage of grain and other commodities exceeds the tonnage of outbound traffic, resulting in the accumulation of empty cars, and that Davenport is intermediate between La Salle and all points on the Rock Island road west of the Mississippi River. The warehouse of the Marquette company at Davenport is located on the Rock Island rails and there would be no inbound or outbound switching charge to absorb with respect to that company's traffic. The only other cement mill directly interested in the proposed transit arrangement at Davenport appearing in support of the schedule was the Dewey Portland Cement Company which has a mill at Dewey, Oklahoma, which has purchased a site and expects to build a new cement mill at Davenport.

Other cement mills which appeared in support of the proposed schedule favored the general application of transit on cement on the ground that they have been seriously handicapped by inadequate transportation and that it is impracticable for railroads to provide facilities ample at all times to meet the transportation requirements of shippers. Four manufacturers operating an aggregate of eight cement mills and four contractors and dealers in cement appeared in support of the proposed schedule. They urged that the only remedy for a lack of equipment during the big load season is for the manufacturers themselves to provide warehouses in which cement can be stored during the dull season at centrally located points for shipment during the greatest demand.

Twenty-two manufacturers operating an aggregate of fifty-four cement mills appeared in opposition to the proposed transit arrangement. Of the railroads other than the Rock Island represented at the hearing, the Chicago, Burlington & Quincy appeared in support of the proposed schedule and the Chicago, Milwaukee & St. Paul and the Chicago, Great Western and the Illinois Central appeared in opposition.

The cement mills opposing the proposed schedule urged that cement is entirely different in character from a majority of the commodities now accorded transit; that the principal reason advanced in this proceeding for the proposed transit at Davenport is that it will afford a means of relieving car shortage. They contended that the proposition that transit privileges will tend to relieve car shortage is not sound, for the reason that there would not be a shortage of cars at La Salle, for instance, when there is a surplus at Davenport. It was further contended that the expansion of cement mills has not been retarded by car shortages and that they have been able to expand satisfactorily without transit.

The cement mills which opposed transit also stated that there is no necessity from the standpoint of the manufacturer, dealer, or consumer which would require a transit arrangement on cement at Davenport or elsewhere. The carriers who opposed the suspended schedule pointed out that the storage of cement in transit would tend to develop the shipment of cement to intermediate points, and that its reshipment later to ultimate destinations would entail greater use of cars to perform the same amount of transportation than a direct shipment from the mill to the point of consumption; that the availability of large stocks of cement in storage would tend to discourage the carrying of a reasonable stock at points of consumption; that the efforts of the carriers to bring about more uniform shipments during a longer period of the year would be defeated if storage in transit be permitted, that the shipment from the mill to a storage warehouse and from the storage warehouse to point of consumption involves two complete transportation services; and that the proposed transit charge of 2.5 cents is inadequate for the service it is intended to cover.

The commission in its decision said. "Cement is sold at a price delivered at the consuming point, so that the freight charges are an important item in the cost of production and marketing. In view of this fact many of the large cement manufacturers have established chains of mills at strategic points throughout the country to meet the competition of local manufacturers in the general consuming territory. It is apparently this situation that is responsible for the desire of the Marquette company to have the benefit of transit at Davenport, and whatever its purpose may be it will obviously serve to lessen the force of competition from the two new cement plants now under construction at or in the vicinity of Davenport.

"So far as the record shows, there is no substantial demand for transit on cement. On the contrary, a large majority of the cement manufacturers throughout the country and many of the carriers are opposed to it on the ground that there is no commercial necessity that requires transit on cement and that its establishment will impose a heavy burden on both the manufacturers and the carriers.

"In addition to respondent the several mills in the La Salle district are served either directly or by means of a switch movement by the Chicago, Burlington & Quincy; Chicago, Milwaukee & St. Paul; and Illinois Central, and of these the Chicago, Burlington & Quincy and respondent both reach Davenport. There is keen competition between the carriers for the cement traffic originating in the La Salle district, and it is not improbable that if the proposed schedule be made effective respondent through that agency alone would secure a substantial share of the competitive traffic. Additional transportation would be required under the proposed transit arrangement. The only transportation necessity advanced in support of the arrangement is alleged car conservation. It is not clear how this could be accomplished by establishing transit on cement at Davenport. The La Salle district is in the same general territory as Davenport, and what would affect one point in times of car shortage would equally affect the other.

"We have said that our authority under section 15 (a) to prescribe just and reasonable rates and to initiate, modify, establish, or adjust rates is not a mere transitory authority to establish in the first instance a general rate structure calculated to produce a fair return, but is a continuing authority to see to it that such a rate structure shall not be undermined and its purpose thwarted by new rates, either increases or reduction, proposed by particular carriers for the purpose of augmenting the traffic of such carriers. (Trunk Line and Ex-Lake Iron Ore Rates, 69 I. C. C., 580.) It is clear that the establishment of transit at Davenport would be followed by similar transit arrangements at Kansas City and Omaha and other important points. If, as clearly appears to be the case, competition would force carriers in all parts of the country to establish transit on cement on such a scale, the effect would be to undermine the existing rate structure. Furthermore, the testimony of witnesses for numerous manufacturers indicates that there is no necessity which requires transit on cement at Davenport.

"We find that the proposed schedule has not been justified. An order will be entered requiring its cancellation and discontinuing this proceeding."

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Excellence

In this issue there appears a paper on the development of standardization, by Frederick W. Kelley, president of the Portland Cement Association. Mr. Kelley's statements show the progress made by the industry in providing the best material possible.

The present is the time of many orders, and the manufacturers of concrete products and other users of cement are under stress to fill these orders. It is hoped that this stress and hurry for accomplishment will not cause the users of cement to deviate in any particular from "quality" in the product they manufacture.

Cement rightly used cannot help but promote the use of the material in greater and greater quantities, but if the manufacturer or contractor in his haste to finish a job or an order does not take care to maintain the ideal of quality, cement and its use will receive a serious setback.

New mills in which cement will be made and vast projects in which it will be used are matters of everyday news. This news shows profound faith in the future of cement.

Let all concerned exercise the greatest care in maintaining high quality standards so that nothing will mar that future.

Let Secretary Hoover Alone!

News dispatches carry word that the Associated General Contractors of America, the American Construction Council and numerous similar and allied interests including several cement producing concerns have approached Secretary Herbert Hoover, of the Department of Commerce, with a request that he call a conference of the various elements of the construction industry to effect a stabilized condition in that industry: Mr. Hoover felt that, conservatively speaking, results might not be altogether beneficial if the government should sponsor such an affair. In this decision we believe that Mr. Hoover displayed far better judgment than did the interests which fostered the invitation.

The memory of man runs short, nevertheless all can recall the events of a scant two and on half years ago. Parties, individuals, groups and crowds were journeying to Marion, Ohio, to listen to the declaration of faith and intention delivered there by the then presidential candidate, Mr. Harding. His most valued thought and most lauded promise was contained in the epigram he coined "Less government in business and more business in government." Whatever we may hear or say about the League of Nations as an issue, the pledge made in the nine words above quoted did more than any other single thing to swing the Harding administration into office with the gigantic force of 7,000,000 votes.

These petitioners for governmental interference into the affairs of the construction industry have not alone forgotten this campaign pledge of the President—they have forgotten their own enthusiasm over that pledge when given. They have made the too frequent mistake of the unthinking; if government interference is detrimental to their particular interests they do not countenance it; if it can be influenced to their liking they are willing to impose it on the other fellow.

This is not to be construed as an implication that the conference which Mr. Hoover might call and the influence which Mr. Hoover might exert would necessarily be harmful. In fact, we believe it would ultimately be of benefit. But we further believe, nay, are certain, that the price which would have to be paid for such benefit would be too great, as it would be nothing short of an acceptance and a welcoming of the principle of government in business. And even that is beside the fact that Mr. Hoover has no time to give to the affairs of one phase of the present day American business problem.

He has a vast job. To his attention come all the enormous questions involved in the commerce problems of the nation. The matters of instructing shippers and carriers in the ways of doing foreign business and of gathering and collecting information necessary for the good of our export trade amount to a man's size job. If the construction industry calls on his personality to settle its maladjustments, every other interest in the country similarly, will be free to call and he would have no time for the work for which he was chosen by the President.

Such conferences and such acceptance of assistance from a government bureau is, as past experience often proves, the entering wedge for government interference and federal control. While government control of the construction field is probably a chimera, nothing is impossible with the Brookharts and La Follettes anxiously scanning the horizon for new hobbies to mount. Few foresaw, a score of years ago, the Goliath that was to grow out of the then innocuous Interstate Commerce Commission. The industrial group that would stay clear of governmental meddling had best not invite it in even its most innocent form.

Further than that, we believe in the construction industry, in its integrity and in its ability. We believe there is no one man or group of men more familiar with its problems and more capable of solving them than are the members of its own personnel. We believe that the Secretary of Commerce should be permitted to follow the path of his duty and his desire by attending to the legitimate affairs of his department. We believe that the Associated General Contractors of America, the American Construction Council and the thirty or more allied interests, including the cement companies, should get together and formulate their own solution.

Shall the State Operate Cement Plants? II

The Important Lesson Taught by Governmental Operation of Our Major Public Utility, the Railroads. Do Other Industries Want the Same Experience?

Fundamentally, what the public is interested in obtaining, whether it is concerned with road construction, transportation, or coal, is in getting the most for the most for the money. If one reads the discussions that have occurred in various state legislatures, the proposal that the state operate cement plants sufficient to provide road building materials has economy as its object.

For example, a reference to a road law passed by the state of Missouri says that the right of condemnation of cement plants "was placed in the road law of 1921 so that the state, if necessary, could acquire cement plants, should prices become too high."

This, of necessity, accepts without question the idea that should private producers of cement offer their product at a price which the state believed too high, the state could and would produce cement at a lower figure. Were this 1900 or 1910, even, the public might accept that proposition without question, but today, after the experiences of the war period behind them, more and more taxpayers are questioning the soundness of that premise. And, if we examine some of the experiments in governmental operation of businesses which have grown up in America under the guidance of private genius, we find reason to doubt the advisability of turning over to the various state governments of the millions of invested dollars which cement plants represent.

In this second of the series of articles discussing the aspect of governmental operation and ownership of cement plants we will take a cursory look at the effect upon the transportation of the country that federal control during and immediately following the war has had. Probably there is none who reads this magazine who has not felt the results of the present conditions of our railroads, with their shortage of equipment, their high rates, and their general break-down of morale among employees. If the cause of the present condition is traced, it leads directly back to governmental operation.

When America entered the world war in April, 1917, it was the purpose of the government to consolidate the energy of the country in order to consummate the war as effectively and expeditiously as possible. One of the first steps taken was for the Federal authorities to take over the transportation facilities of the country and to operate them under the control of a director.

Immediately railway employees became Federal employees, and, because they were organized, they were treated far differently from Federal employees in the post office, for instance. Their wages were raised repeatedly; their hours were shortened, and the net result was a decrease in their sense of responsibility. Men who had been paid $125 a month for round house work, for example, found their income more than doubled; they were given a helper who did practically all the work they themselves formerly did, and the cost of railroad operation more than doubled.

The next problem was to find a revenue that would meet this added expense. Rates, both on passenger and freight traffic, increased materially and still the railroads continued to show a growing deficit in spite of the fact that, under government operation, consolidations of ticket offices, elimination of duplications, and other economies, that private operation do not accomplish, were possible. When the war ended, and the roads were partially turned back to their owners, the net deficit had reached approximately $1,800,000,000. Naturally this loss has to be made up out of taxation, and is still being paid for by the taxpayer.

But the cost to the public does not stop there: it is still going on and threatens to continue for years to come. Immediately following the return of the roads to their owners the country was confronted with a railroad strike, the direct result of the high wages paid during the war. Since private management, such as it is today, took hold it has been impossible to restore the morale of the employees to the point where it was before the war. The railroad man formerly took pride in his work; today he takes only pay, and does less than formerly, and does it less efficiently.

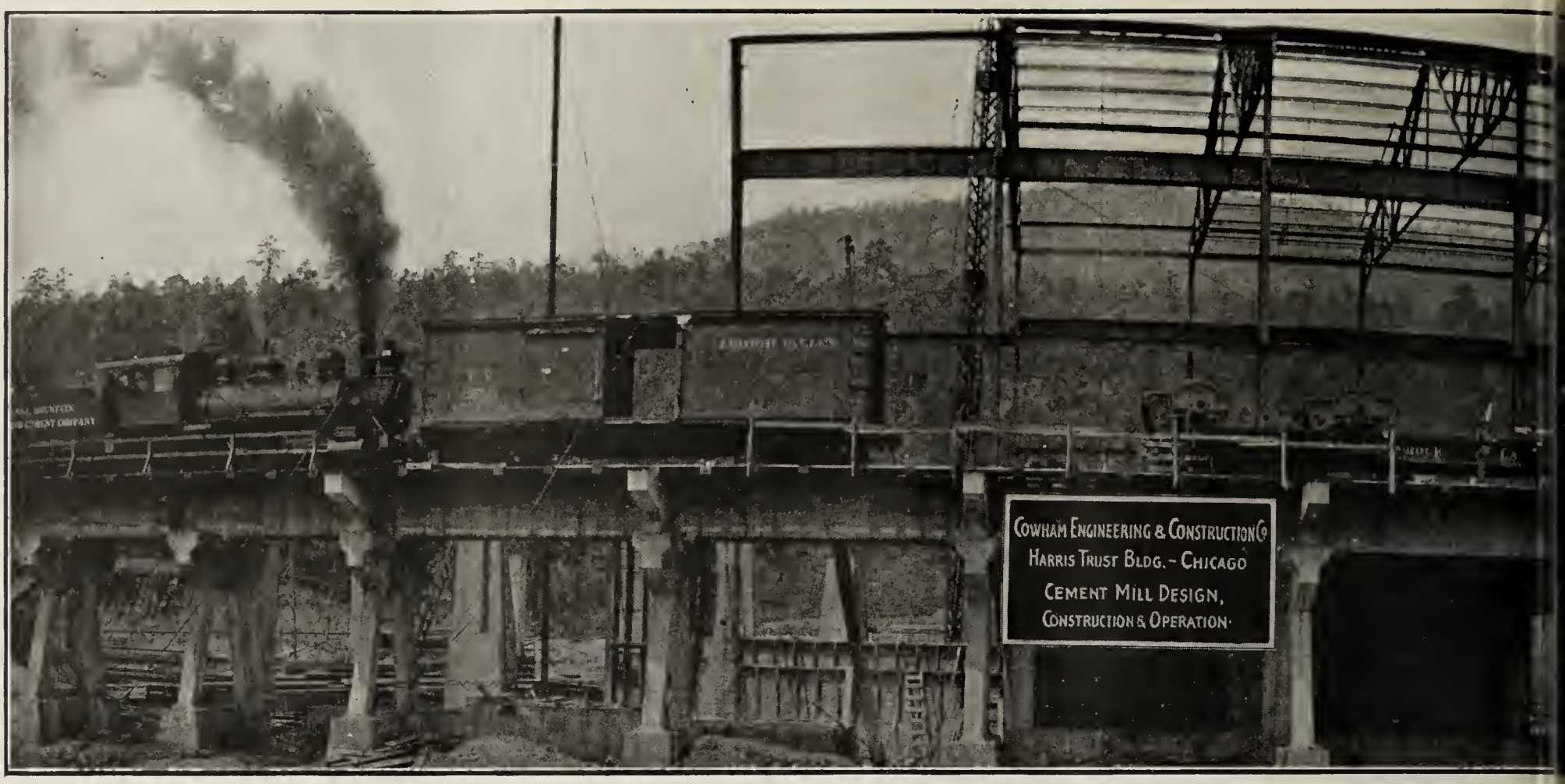
During the war the government operated almost entirely with the rolling stock then in existence. Little replacement was done either of equipment or trackage, so that the country found itself at the end of the war with a railroad system that is totally inadequate to its needs, and with its financing in such poor condition that it was impossible to buy needed cars, engines, and steel for new tracks. Government operation so despoiled the roads that new capital could not be found: the investor was not sure enough of a return on his money, so he would not invest. Even in the days of watered railroad stocks such a condition had not obtained; rates were not as high, and commodities got moved.

It is difficult for all of us humans to renounce power once obtained, and the government has not even to this day released the railroads entirely to their owners. The executives of the roads find themselves entangled in a mesh of red tape which hampers their efforts at improvements and leaves the public unable to place responsibility for the admitted inefficiency of our transportation. In short, the roads are much in the condition which Browning attributes to Saul in his poem of that name: "Death gone, life not come."

Compare this condition with the one that obtained just prior to our entrance in the war. At that time the allies were largely dependent upon America for war supplies and the American railroads were moving an abnormally large quantity of freight. This they moved efficiently, at lower freight rates than have ever obtained since government control, and with the employees contented and taking that pride in their achievements that is essential if economy and efficiency are to exist.

If government failed in its conduct of transportation, why should we believe that it will succeed in the operation of cement plants? Will the concentration of millions of dollars, to be handled by politicians with patronage to consider, bring economies which the struggle of competition fails to produce? Do we wish to pay twice for the road building materials in the future: once in taxation to provide funds for the acquisition of plants, and again, in taxation for funds to cover losses resulting from state operation?

Editor's Note: This is the second of a series of editorials discussing the subject suggested in the title.



Substantial construction is the watchword at the Signal Mountain Portland Cement Company's new plant near

The South Has Most Modern Cement Plant

The New South Erects a Modern Mechanical Palace on a Site Where the Old South Made History

Signal Mountain, that historic rock ridge near Chattanooga, which served as an inspiring beacon to the Old South of the Confederacy, will take on a new significance as a guide light to the future of the New South within the next few weeks. A new industry of great potential power to the whole area from the coast to the Mississippi and from the Ohio to the Gulf will soon begin production when the first unit of the $3,000,000 Signal Mountain Portland Cement Company plant is placed in operation.

Present indications are that actual production will start this summer and a daily output of 2,500 barrels will be maintained while the remainder of the plant is being completed. When in full operation a daily capacity of 5,000 barrels is contemplated.

The Signal Mountain site was selected after an exhaustive survey by the expert cement mill builders who are in charge of the plant and it is conceded to be the most promising location for a mill of this type south of the Ohio river and east of the Missisippi.

The site is about five miles from Chattanooga on the Dixie Highway. A mile of waterfront along the Tennessee River affords immediate docking facilities and from this point the company's holdings, comprising 406 acres, rise gradually toward the face of the mountain. The unusual features of the site may be summarized as follows: A paved road leads to the business section of Chattanooga; a belt line from tract connects with nine railroads in addition to water transportation possibilities; raw material on site sufficient for at least seventy years' operation; core drill tests to depth of four hundred feet show limestone rock high in calcium and low in magnesia in ideal proportion; gravity flow from raw material supply to finished clinker made possible by natural slope of land effecting striking economy of operation; labor supply adequate without "importing" employes other than technical men in charge of departments; fuel supply assured by fact that several mines now operate within fifteen miles of plant; coal deposits on Signal Mountain can be worked.

With these things as a basis, it appears a certainty that the operation of the new company will be successful from the start despite the intricate and painstaking processes required in the manufacture of Portland cement. In addition to the outstanding natural advantages, the plant itself will be constructed along the most modern lines and will be in charge of men who have successfully carried on cement manufacture for years.

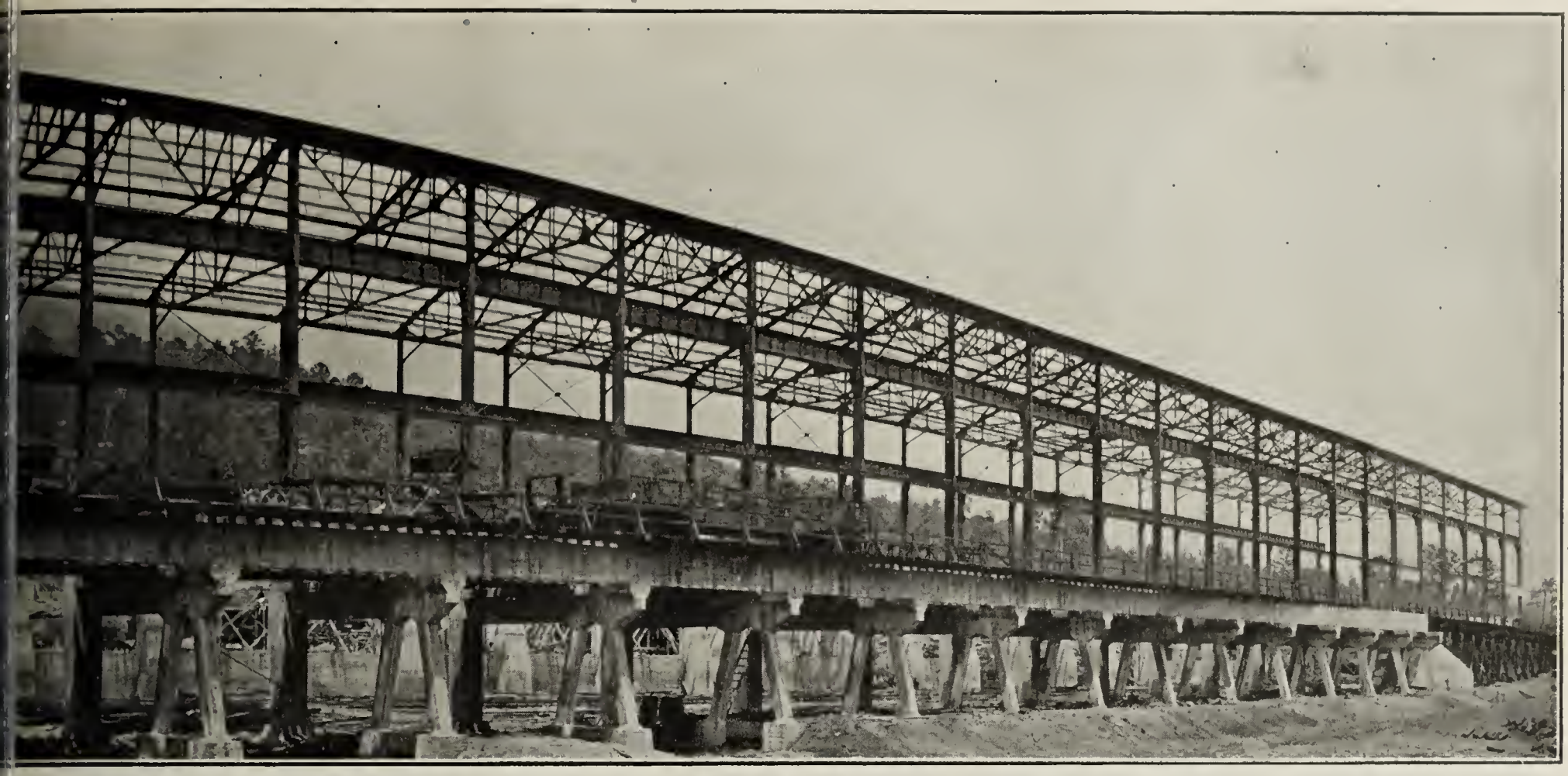
Particular attention has been given to the mechanical equipment with a view toward standardization, efficiency, economy and quality production. Listed among the firms with which contracts have been placed for machinery and supplies are the following: The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., kilns, coolers, grinding mills, coal dryers, primary crusher, hydraulic pumps, wash mill and motors; The Williams Patent Crusher and Pulverizer Co., St. Louis, secondary crusher; The Chain Belt Co., Milwaukee, all elevators; The Fuller-Lehigh Co., Fullerton, Pa., coal grinding mills; The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., electric traveling crane; The Walsh & Weidner Boiler Company, Chattanooga, Tenn., all structural steel and smoke stacks; Mills & Lupton Supply Company, James Supply Company, Rogers-Bailey Hardware Company, Chattanooga, all miscellaneous hardware and fittings; The Chattanooga Boiler & Tank Company, all tank work; The U. S. Cast Iron Pipe & Foundry Company, Chattanooga, all cast iron pipe; The Ingersoll-Rand Co., jack hammers; The Crane Company, special valve fittings for water system; The Chicago Pneumatic Tool Company, Chicago, Ill., and Pennsylvania Pump & Compressor Company, Easton, Pa., air compressors; The Kilby Frog & Switch Co., Birmingham, Ala., all switch material; The Dixie Portland Cement Co., Richard City, Tenn., Royal Brand Cement; The Tennessee Power Co., power; W. J. Mills, Chattanooga, lumber and cross ties; The Dixie Sand & Gravel Company, Chattanooga, all concrete sand and gravel; The Ohio Brass Manufacturing Company, Mansfield, Ohio, fittings for electric railway; The Dudley Bar Sales Company, Chattanooga, reinforcing bars for concrete; The American Cement Tile Manufacturing Co., Pittsburgh, Pa., tile roofing; The Chattanooga Pole Co., poles for electric railway.

The material now being purchased and on which deliveries will be received before the starting of the first unit, include machine shop equipment, corrugated siding, cotton sacks and sack repair department machinery.

With carefully standardized equipment of extra heavy construction, it is reasonably certain that lost time through breakdowns will be held at a minimum. Investment in spare parts will be materially decreased and repairs can be made without interfering with the working units in other parts of the plant.

In the actual operation of the plant, too, this practice of economical continuity has been maintained at a high level of efficiency. Probably less materials will be carried on conveyors and elevators in proportion to total production than in any other cement plant in America.

The limestone quarry is located 1800



Chattanooga. The approaches and the buildings will stand the heavy strain usual in the manufacture of cement

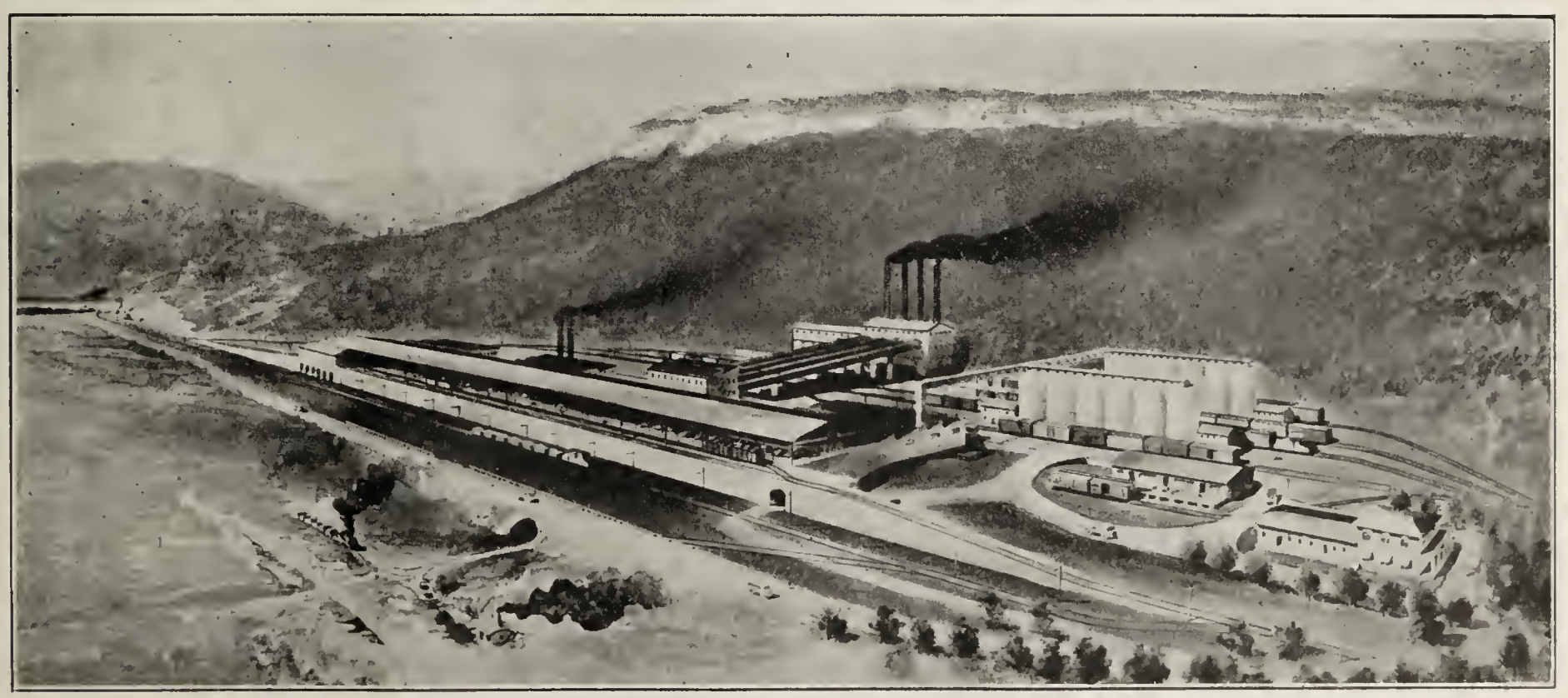
feet west of the plant, and includes 100 acres of limestone that runs 400 to 500 feet deep and is expected to last seventy-five years. The stone above ground level has a slope of about 5 degrees west. The operating face to start with will be 800 feet long by 30 feet high. This can be increased to 2000 feet by 175 feet high. Overburden is negligible and will not impose any added cost on the quarry operation. Electric well drills and jack hammers will be employed. Loading will be done with a Bucyrus shovel with 3½-yard bucket, dumping into Western air side dump cars. Haulage to the plant will be accomplished by a 50-ton Baldwin locomotive, switch type.

The clay field is located just across the Dixie Highway from the plant. The deposit includes seventy-five acres of clay running to a depth of twenty-five feet. The occurrence is in a solid bed that requires no stripping. Loading will be done by an Erie type B shovel into Western air side dump cars.

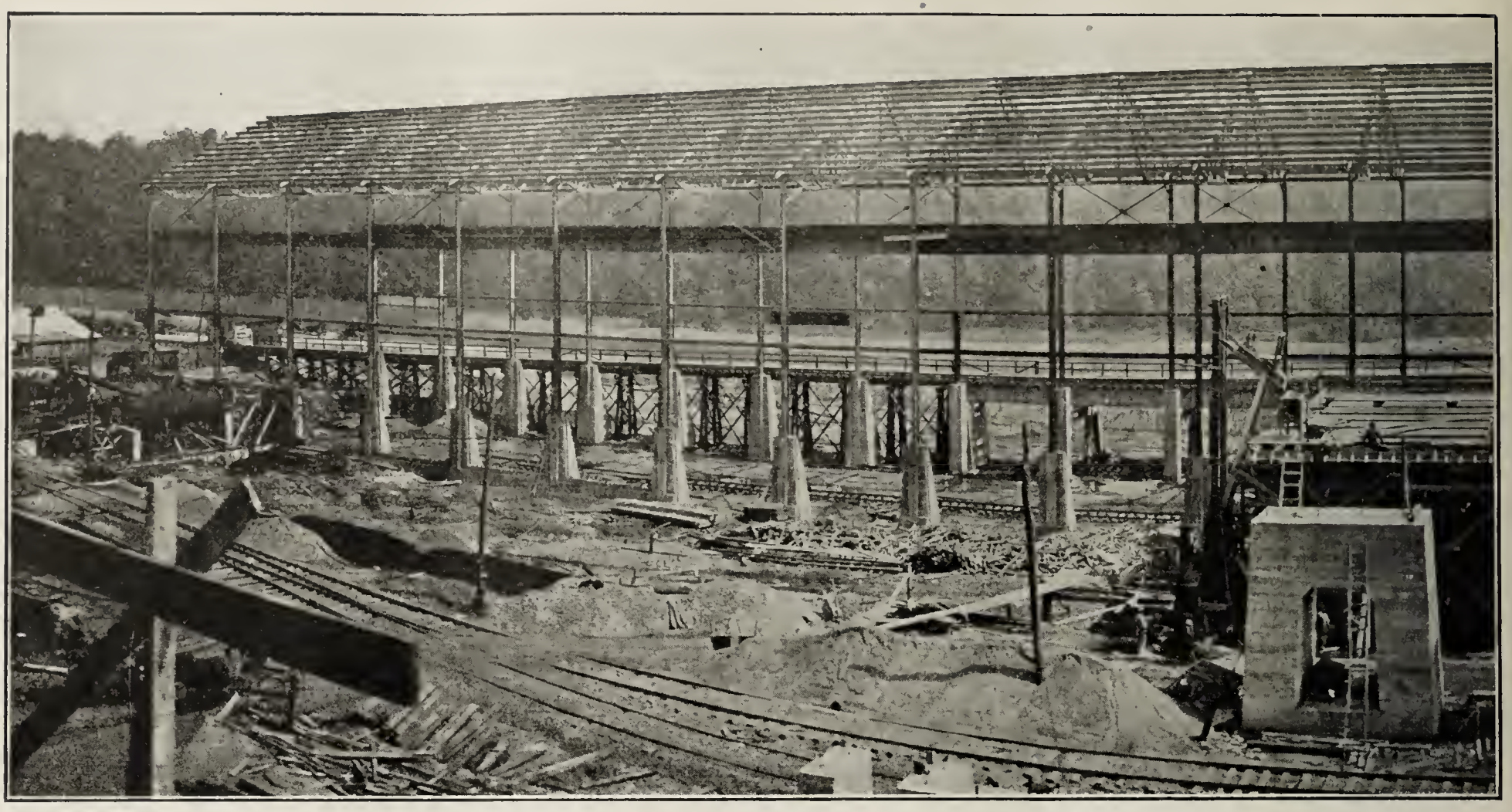
Limestone brought to the plant by the means described will be taken up on a trestle leading to the crushing plant. The cars will be dumped by air into a hopper above a No. 21 Allis-Chalmers gyratory crusher. This machine will reduce stone to 8-inch size, after which it will be picked up by a pan conveyor and passed to steel storage tanks. A traveling grizzly will carry this product to two No. 6 Jumbo Williams mills, which will reduce it to 1½ inches. These jumbo crushers, products of the Williams Patent Crusher & Pulverizer Company of St. Louis, Mo., have a capacity of 300 tons per hour of 8-inch stone and will reduce it to 1½-inch and finer in one operation.

In the same building that serves for storage of raw limestone, space is provided for storing clay. This material is brought up in Western side dumping cars of 12 cubic yards capacity each. These cars are dumped by air. The clay is then passed to an Allis-Chalmers 25-foot American wash mill in which it is thoroughly washed and passed with limestone rock into the wet grinding mills. The transportation of the material from the raw storage to the wash mills and raw grinding mills is accomplished by Shepard 2½-yard electric overhead traveling cranes of 80-foot span.

The work of the raw grinding department is handled by four Allis-Chalmers 7x22-foot compeb wet mills. These compebs receive their supply of stone from bins through Allis-Chalmers type H feeders. The clay is introduced through specially designed feeders.



When completed, this modern plant will look like this. A vision made reality



This view taken from the Signal Mountain side will

The raw storage is designed to accommodate 15,000 tons of crushed stone, 5,000 tons of clay, 2,500 tons of gypsum and 5,000 tons of coal. Under the same roof is the clinker storage, designed to hold 150,000 barrels of clinker.

After the limey and clayey components of the raw mix have been thoroughly ground in the compeb wet mills to the requisite fineness, the resulting slurry is taken up by a 4-inch rubber-lined slurry pump and passed through pipe lines to the slurry storage tanks that have a capacity of about 6,000 barrels. Compressed air and mechanical methods will be used to agitate the slurry.

The kilns, 175 feet in length with diameters of 11 feet, were built by the Allis-Chalmers Company. Temperature will range from 1200 degrees F., at the feeding end, to 2850 degrees F., at the burning zone near the firing end. Four of these kilns will be utilized in the complete 5,000-barrel plant. Each kiln will have a capacity of 1,250 barrels daily and each unit will employ one kiln. Thus, in the first two units which the company intends to put in running order as soon as possible, two kilns will be used. The other units will soon be added.

The unit design of construction makes it possible to carry the project to completion while the first unit is in operation. In this way the company will be in a position to help meet the demands of the territory served while the plant is still under construction. It may be well to mention, while speaking of unit construction, that the plant has been so designed that additional units can be added later without disturbing what is then in operation. In other words, if it is desired, after the complete 5,000-barrel plant is built, to considerably increase the capacity, other units can be built without changes in the existing layout.

Firing in the rotary kilns will be with coal which will first be dried in an Allis-Chalmers 8-55-foot Ebro type driver. It will then be pulverized by Fuller mills, elevated by blowers to the pulverized coal bins above the feeder, and from there blown into the kilns.

It is worthy of notice that the transportation of the mix from the feed bin to the clinker storage utilizes gravity to the fullest extent. After coming from the kilns, the clinker drops down to 8x70-foot rotary coolers through which it passes and falls direct to the storage.

Clinker will be taken out of storage by an overhead traveling crane and from there passed on to four 7x22-foot compeb dry mills. After these complete the work of grinding it to 200 mesh, the finished cement will be taken up by style B bucket elevators and 16-inch screw conveyors and passed on to the silo bins for storage. Sacking houses are located in four places, one at each end of two series of six cement storage tanks. Across loading track No. 1 from the cement storage bins, silos, and sacking houses is the sack department where sacks are repaired for use on the packing machines.

When complete the plant will present an imposing appearance. The storage building will be 700 feet long and 80 feet wide. The raw grind building will be 150 feet long, the coal drying building 100 feet long and the finish grind building 150 feet long. All of these buildings will be 75 feet wide. The complete plant itself will be more than 2,000 feet in length. On the grounds will be located offices, shops and stock rooms, together with such other necessary parts of a large enterprise, as water storage tanks, etc.

Twelve silos, 30 feet in diameter and 85 feet high, will comprise the bulk storage unit. They are entirely of reinforced concrete. Cement will be drawn from these silos for conveying to the sacking department and elevated to tanks above the packing machines. Arrangements call for loading facilities which will enable the plant to load eight cars simultaneously, a total shipping capacity of 12,000 barrels in a ten-hour day.

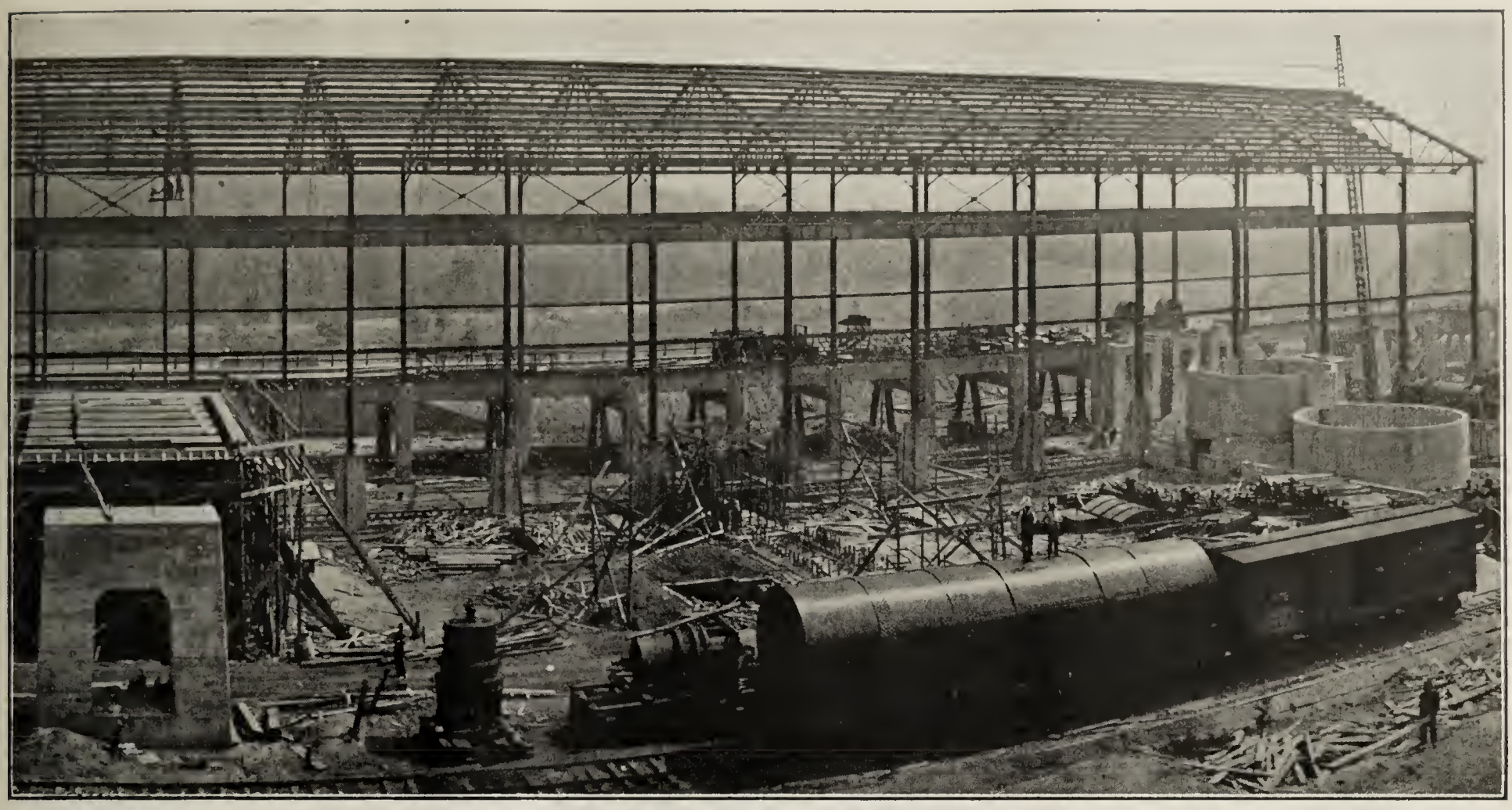
It is estimated that the simplicity of operation worked out through advantageous natural facilities will enable the Signal Mountain plant to manufacture cement at a labor cost of .33 man-hours per barrel. This cost, if it is maintained, will be 50 per cent less than the 1921 average for 82 plants, which was .816 man-hours for every barrel manufactured and shipped.

The men associated in the formation of this company are indicative of an efficient organization in the handling of the company's business. Officers and directors follow:

John L. Senior, president, who is also president of the Peninsular Portland Cement Company; C. S. Steward, vice-president, is president of the C. S. Steward Manufacturing Company, Chattanooga; J. L. Caldwell, vice-president, is president of the Tennessee Stove Company, Chattanooga; J. P. Hoskins, treasurer, is vice-president and cashier of the First National Bank of Chattanooga.

In addition, W. A. Sadd, chairman of the board of directors, is president of the Chattanooga Savings Bank; Charles Closz, director, is president of the Closz Manufacturing Company, Webster City, Iowa; D. F. McPherson. director, is a member of the firm of Cutting, Moore & Sidley, attorneys of Chicago; F. A. Stephenson, director, is president of the Ideal Sand & Gravel Company, Mason City, Iowa; C. W. Howard, director, is manager of the Industrial Board, Chattanooga Chamber of Commerce, and R. G. Wright, director, is president of the Wright-Cruze Hardware Company, Knoxville.

The engineering and operating staff will be built around a nucleus of experienced cement manufacturers with John L. Senior as general manager; A. C. Deer, operating manager of the plant; F. E. Dodge, consulting engineer, and R. S. Conner, chief chemist. Sales will be handled by J. I. McCants as manager of that department. Mr. McCants was identified with the Standard Portland Cement Company, at Leeds, Ala., for twelve years and is well known through the southern territory. It



give full details of the storage building construction

is planned to carry on intensive sales campaigns in the area between the Ohio river and the Gulf and from the Atlantic seaboard to the Mississippi river. In this vast field, large sales opportunities are presented by the rapid growth of southern industry. One strong competitor exists in the Dixie Portland Cement Company, at Richard City, thirty-five miles from Chattanooga. This plant has a capacity of 4,000 barrels daily, but its officials have expressed their gratification at the entrance into the business arena of a new company and are sanguine of success with the great sales area in the states from which both will draw their patronage.

The mill is being designed and built by the Cowham Engineering & Construction Company of Chicago, one of the oldest engineering organizations in the country specializing in the building and operating of cement plants. Founded by W. F. Cowham in 1899, it has been identified with the cement industry since the days of the old vertical kilns. The personnel of the organization is as follows:

John L. Senior, president; F. E. Dodge, vice-president and chief engineer; A. C. Deer, vice-president and construction manager; H. J. Weeks, secretary, and F. W. Boley, treasurer, all of whom have had many years of close association with the industry.

Mr. Dodge as chief engineer has charge of all engineering work. He has been identified with the designing and building of six of the best-known plants in the United States and Canada and one in South America. One of the first waste heat boiler installations in the industry was put in by Mr. Dodge, and few engineers can bring a wider or more intimate technical training to bear upon a cement problem.

Mr. Deer has been in the Cowham organization for over twenty years and has served in various capacities from accountant to general manager. Mr. Weeks, for many years a consulting engineer on reinforced concrete, has but recently retired from the army with the rank of Major. During the war he held the rank of Lieutenant Colonel of Engineers. Mr. Boley has had many years of experience in the intricate work of accounting on cement mill construction and plant operation.

It is interesting to recall that in 1902 the Cowham organization built one of the first portland cement plants in the south, the "Southern States," at Rockmart, Georgia. After over twenty years of steady production, this plant is still in successful operation. The great industrial development of the south and the rapidly increasing demand for cement there amply justify the judgment of the Cowham Company in locating a second southern plant at Chattanooga.

Solving the Ash Problem

The Alpha Portland Cement Company has installed an American steam jet ash conveyor at its Bellevue, Michigan, plant.

This apparatus has done away with a great deal of trouble in securing the labor necessary to move the ashes from the power house. Bellevue is situated in the heart of rural Michigan where labor is not easy to secure, and the company in line with the modern tendency has done away with this human element in the disposition of the ashes. The details of this installation as furnished by the manufacturers, the Conveyors Corporation of America of Chicago, are as follows:

The steam jet method of ash removal is simple. A line of hard matla pipe, of six, eight or nine inch diameter is laid in a trench in the boiler room floor. This conveyor line is equipped with intakes, one before each ash pit. At one end of the row of intakes, usually at an angle in the line, is placed a fitting through which a jet of high pressure steam is introduced into the system.

The rush of steam creates a vacuum which in turn creates a suction of sufficient velocity to carry with it ashes and cinders as they are fed into the conveyor system. These ashes must be dry as wet ashes clog the conveyor.

When the fireman cleans his fires, he opens a valve allowing the steam to rush into the system. He then removes the intake cover and shovels or hoes the ashes into the opening. The conveyor when correctly designed will handle the ashes as fast as they can be fed into the line. When the pit is clean, the cover is replaced and the ash handler moves on to the next pit where he repeats the performance.

Ashes are usually discharged into an ash storage tank from which they are later withdrawn into trucks or cars and hauled away. These tanks may be constructed of concrete or cast iron. The tank at the Bellevue plant of the Alpha Portland Cement Company, referred to above, is made of concrete as will be noted in the accompanying illustration.

The Development of Standardization

The Cement Industry's Policy of Voluntary Standardization of Its Product Has Brought Definite Benefits to All Who Use Cement

By Frederick W. Kelley

Development of standardization in the cement industry was described by Frederick W. Kelley of Albany, N. Y., president of the Helderberg Cement Company, in an address at a meeting of the fabricated production group at the annual convention of the Chamber of Commerce of the United States in New York May 8. Mr. Kelley's topic was "The Voluntary Setting Up of Quality Standards in Commodity Production."

Mr. Kelley gave credit to the Bureau of Standards for its work in connection with cement standardization. He said that the industries of the country would do well to become familiar with the facilities of this bureau and that industries which have not already established standards should carefully consider the advantage of determining standard specification requirements through voluntary action by consumers and producers instead of waiting for the imposition upon them of standards determined by an outside authority.

Mr. Kelley's address was as follows:

"Quality and quantity standards are essential for the free interchange of commodities in commerce beyond the stage of first hand transactions in which personal observation and opinion govern. Progress in civilization is measured by commerce so standards are at the base of civilization as well as of commerce.

"Standards of time, space, weight, value, and conduct are as history. They are so much a part of the environment into which each generation is born that there is no conscious recognition of a period when they did not exist, any more than in the case of the air we breathe. But all these standards had to be determined and established. Probably the first generally recognized minimum quality standard was that of conduct.

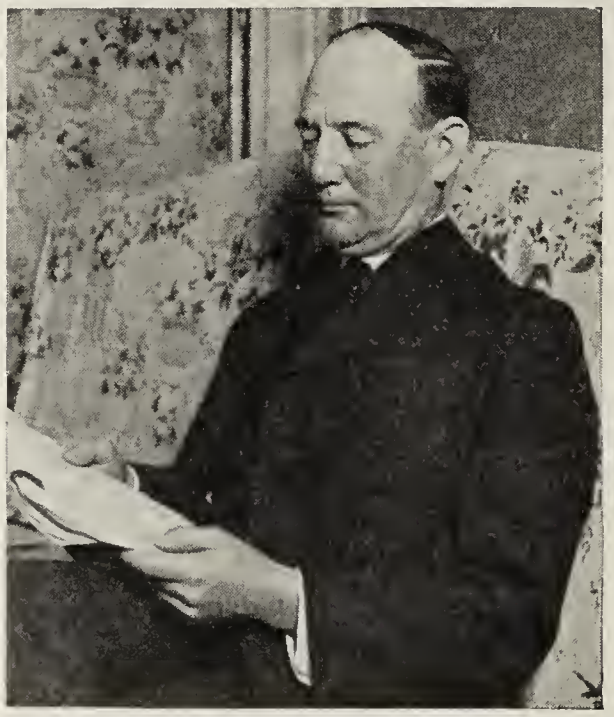
"Every thinking man must recognize the necessity for standards and the desirability of providing recognized quality standards in almost every line of industry. There are in each industry, however, the practical questions—what should the standards be; how should they be determined; how can their acceptance be best accomplished?

"There are at least twenty industries in which nation-wide quality standardization has been undertaken to a greater or less degree. The one with which I am most familiar is the Portland Cement industry in which a quality standard for cement accepted throughout the United States was voluntarily established through the cooperation of a large number of public and private engineering and technical organizations concerned with the use of cement.

"Each industry has its special conditions and special problems but I believe the same principles apply to quality standardization in all industries, and that properly worked out, favorable results in them all will follow. The experience of the Portland Cement industry may therefore be useful to other industries, and I hope you will bear with me while I bring out a few facts which will show why a nation-wide standard was essential, and will make clear how it was established.

"Portland Cement, as is well-known, is a powder which when mixed with water and sand, broken stone, or other aggregates, gradually hardens and binds the mass together in a solid stone known as concrete.

"Portland Cement was discovered and patented in England ninety-nine years ago. Its manufacture was carried on principally in England, France and Germany until about 1872 when its production was begun in a small way in the United States. The average annual production in the United States in the '70s was about 9000 barrels. It had grown to a little over a half million barrels in 1892; to about seventeen million barrels in 1902; and to nearly 115,000,000 barrels in 1922. Estimates just made public by the U. S. Geographical Survey give the estimated productive capacity of the United States as 146,500,000 barrels annually.



Frederick W. Kelley

"The manufacture of cement is an exact chemical-mechanical process in which natural raw materials are ground and mixed; combined at a white heat to form a new artificial material called clinker, which is again ground to a finished product. The process is exactly controlled technically; uses large quantities of fuel and power; has large plant investment and slow capital turnover. Manufacturers must rely upon a large volume of business to make profits on this heavy commodity which is of limited shipping radius, and which sells at a pound price lower than any other highly manufactured article.

"Portland Cement when completely manufactured and ready for the consumer, is in its relation of usefulness to the community, a means and not an end. Its useful end is that of an essential ingredient in making concrete.

"Concrete has a wide use because of its adaptability; of the ease with which it can be handled and formed into manifold structures; and of its qualities of permanence, fire-proofness, and artistic appearance.

"Cement, unlike many commodities, is not consumed. A concrete structure properly made has a permanent asset value. Full realization of this asset value, continued demand for cement, and the prosperity of the industry, depend upon right quality cement and right quality concrete.

"Anybody anywhere may attempt to make concrete and the results reflect for all time the materials and methods used in the first few hours of its history. It is essential to all interests that the user of cement make good concrete.

The Factors in the Cement Industry

"The work of the Portland Cement Association, organized in 1902, which is a recognition of this mutuality of interest between cement user and manufacturer, is so closely bound up in the development of the industry that it must be here mentioned.

"The Portland Cement Association is a national organization of cement manufacturers whose aim is to increase the knowledge, utility and use of Portland Cement through scientific investigation, public education and national promotion. It 'sells' the use of cement, but not the commodity. Hence it is not concerned with prices nor other trading relations between its members and their customers. It performs only such functions as cannot as well if at all be performed by its members individually. It undertakes only such activities as are for the common good and whose benefits when utilized, flow alike to all contributing members. Its conduct is jealously guarded and made to scrupulously conform in all respects to a high conception of commercial morality and a strict interpretation of the law. It is much concerned with the quality of cement marketed by its members, since a poor quality cement furnished by any member would reflect upon the industry, decrease the use of cement, and hence injure every member.

"The Association has been especially concerned not only with right quality cement, but with learning how to use cement right, and with making this information universally known. It maintains a research laboratory and field forces for these special purposes. When it is realized that an apparently simple matter like the quantity of water used in mixing cement may make the difference between good and bad results, the need for this service work may be appreciated.

"Mention should also be made of the American Society for Testing Materials, organized in 1902 'for the promotion of knowledge of the materials of engineering and the standardization of specifications and the methods of testing.'

"Its members are both producers and consumers familiar with the matters covered. Specifications are formulated and adopted under carefully prepared rules of procedure insuring to the highest degree, sound unbiased results.

"Important factors in the situation are the Bureau of Standards of the U. S. Department of Commerce, with its group of trained experts and the extensive laboratory equipment, and the several

engineering societies to be hereafter mentioned.

The Development of Specifications

"With this background of conditions and factors affecting the industry we can now more intelligently trace the development of quality standards for cement. In the early years when the industry in this country was small, its quality standards were imported. As the industry developed, the American Society of Civil Engineers undertook to formulate a uniform method of tests for cement, and from 1885 to 1903 this was considered the most reliable guide to a proper method of procedure.

"In this period, many engineers and architects seemed to feel, perhaps to avoid reflection upon their professional skill and progressiveness, that it was necessary to add to an old cement specification, some new requirement on each new job. A compilation of ninety-one cement specifications made in 1898 by Mr. R. W. Lesley, who later became first president of the Portland Cement Association, showed that scarcely two were alike. In many cases, the specification requirements were contradictory, and if strictly followed, would sometimes impair the quality of the cement. The result was unnecessary and caused endless annoyance, confusion, delay, and difficulty for the consumer and manufacturer alike. A standard specification was becoming a necessity.

"The American Society for Testing Materials, took the lead in supplementing the investigations of the American Society of Civil Engineers, and in 1904 the first American Society for Testing Materials' specification for cement was adopted. The American Railway Engineering Association, American Institute of Architects, the United States Bureau of Standards, the U. S. Government Engineers, and the Portland Cement Association, as well as the American Society for Testing Materials and the American Society of Civil Engineers, continued to study and to modify cement specifications and methods of tests sometimes within their respective organizations, and sometimes through joint committees.

"The method of the American Society for Testing Materials was unique in that its committee on cement specifications represented engineers, architects, and other consumers who were always a majority, as well as producers, who were always a minority. This brought to bear upon the specification requirements a knowledge not only of the needs but also of the possibilities. Specifications made under these conditions are much more apt to be well balanced and useful, than if made from one point of view only.

The Adoption of Specifications

"The final revision of the cement specification was unique, also, because its requirements were subjected to the most careful laboratory research and checked with experience in the field. The substitution of the facts of research, for unsupported opinion, had its logical effect in reconciling views of men with engineering training. A single standard cement specification became an accomplished fact and was recognized by all established organizations in the United States in 1921. This was adopted on March 31, 1922, by the American Engineering Standards committee as its specification Number One.

"As the standard cement specifications were developed, much work was required to secure their general use. Engineers who for twenty years had been active in the engineering societies which formulated and later adopted the specifications, readily accepted them. Others not as familiar with the progress made, continued to use their own specifications until the mass of data and authority back of the standard specification was brought to their attention, when they generally were glad to join in establishing a single standard, the advantage of which they at once recognized.

"Neither did all producers at once take up the specifications as developed. In the early days of the industry, blended and adulterated cements were sold under many brands. Membership in the Portland Cement Association was later open only to those making true portland cement.

"Producers in some cases were reluctant to give up making cement to conform to certain special specifications because of a supposed advantage in marketing thus obtained by them.

"The research work and tests made in establishing the standard specification showed, however, that the existing variations from the standard were without economic value to the consumer. The general adoption of the standard specification by the engineer and consumer decreased the demand for cement made to special specifications, but it should be accounted a credit to these producers that they were willing to cut out the "bunk" so frequently used in selling, and provided a product having known and tried qualities and value.

"On June 28, 1922, the Portland Cement Association, representing a large part of the manufacturers of portland cement in the United States, adopted a by-law making membership in the association contingent upon member's product meeting the requirements of the standard specifications.

Features of the Specifications

"At the present time, the standard specification for cement is almost universally used in this country. Thus we now have a nation-wide quality standard for portland cement voluntarily accepted by both consumers and producers. It is the highest standard forcement in the world and has had an important effect in promoting, extending, and improving the use of concrete in this country.

"When compared with earlier specifications it is particularly noticeable that the fineness of cement is now measured with a sieve having 40,000 openings per square inch, a weave so fine it will hold water; instead of with relatively coarse sieves which have now been discarded. The strength requirements are nearly double those of early specifications and are determined by improved methods.

"The standard cement specifications establish in most essential particulars minimum requirements, thus encouraging improvement. A quality standard must be responsive to changes demanded by new conditions in use or in production.

"The cement committee of the American Society for Testing Materials is charged with the duty of studying proposed improvements in the cement specifications. Each suggestion is carefully tested and weighed, for in a material of such fundamental importance there must be certainty that changes are improvements. Laboratory practice has now reached a point where it is possible to determine this with a high degree of accuracy and laboratory results can always be supplemented by field tests.

The Advantages of a Single Standard

"The working out of this situation and establishment of a single standard quality specification for cement has had, and must continue to have, many advantages for consumers, producers, and the community as a whole. The engineer and designer can rely upon getting anywhere the standard quality cement contemplated by the plans. Concrete can be designed of definite strength and quality. Simple rules have been made by which even the inexperienced can with care get good concrete. Greater efficiency in production and lower cost has been made possible through continuous operation on a standard product. A standard product can always be kept in stock ready for use. A standard product is more readily accepted in export trade. Wider production of cement has been made possible by eliminating unnecessary limitations on raw materials. In 1922 cement was produced in 118 plants in 27 states, compared with 65 plants in 19 states in 1902.

"Nearness of production to markets has followed wider production. When it is known that the freight charges on a barrel of cement for an average 100 mile haul, are about thirty per cent of the average mill price per barrel for the last three years reported by the U. S. Geological Survey, the importance of this will be appreciated.

"Each standard established makes easier the establishment of other standards. The establishment of the cement specification makes easier the establishment of a specification for concrete. In the concrete specification now in process of formation, the cement specification and specifications for twelve other materials or methods entering into the making of concrete, are included. Better and cheaper concrete structures are the net result.

From the Indefinite to the Definite

"The Bureau of Standards deserves the very highest credit for the sturdy support and valuable assistance it has given to all cement standardization work. The industries of this country will do well to become familiar with and utilize its facilities and knowledge readily placed at their disposal. The opportunity offered by the American Society for Testing Materials for cooperative work on specifications within its field, is worthy of attention.

"Industries which have not already established standards may well consider carefully the advantage of determining standard specification requirements through voluntary action by consumers and producers, rather than wait for a specification determined by some outside authority to be imposed upon them.

"The principle underlying this standardization is that underlying all progress —the movement from the indefinite to the definite. The trend is certain. To voluntarily accelerate progress in the direction it will inevitably take, is the part of wisdom."

The Chicago Automatic Conveyor Company of Old Colony Building, Chicago, has issued a catalogue which will be interesting to everyone having to handle sand, gravel, road material, cement, and other bulk material. The pamphlet is very well illustrated and is featured by line drawings showing the method of operation. These drawings, especially one showing the storage of cement, indicate how one may reduce cost of the operation considerably by the use of the automatic conveyor.

The Menace of Duplicate Orders Discussed

The American Construction Council Discusses the Present Construction Situation. The Remedies Suggested

WASHINGTON, MAY 28.—An investigation of assertions by cement manufacturers that buyers of cement have duplicated their orders quite generally and that this factor in the building situation constitutes one of the dangers of inflation was set in motion at a meeting of the executive board of the Associated General Contractors of America in New York on May 15. This meeting took place a day in advance of the meeting of the American Construction Council, an organization representing all elements in the construction industry, at which a program was adopted urging that all new construction be deferred for several months in order to avert a soaring of prices, harmful inflation and a subsequent depression.

The executive board of the Associated General Contractors discussed at considerable length the statement of cement producers with respect to a duplication of orders. The statements in question were contained in a letter to Secretary of Commerce Hoover signed by six cement companies.

About thirty contractors from different parts of the country were in attendance at the meeting. It is understood that they disputed the assertions of the cement manufacturers and declared that while some instances of a duplication of orders may have occurred the practice was by no means general. Many of the contractors stated that they were in the habit of ordering ten per cent more cement than they actually needed but that they had not exceeded this margin as a general rule.

Officers of the organization were instructed to make a full investigation of the subject and to ascertain as definitely as possible the truth or falsity of the charges. It was understood that the results of the investigation will be submitted to Secretary Hoover.

The meeting of the American Construction Council at which a program for curtailment of building activities was announced was brought about through the activities of Brig. Gen. R. C. Marshall, Jr., of Washington, general manager of the Associated General Contractors. Gen. Marshall had been active in the movement to induce Secretary of Commerce Hoover to call a conference of the different elements in the construction industry with a view to bringing about a stabilization of conditions. Twenty-five or thirty national organizations joined with the Associated General Contractors in urging such a conference but Secretary Hoover seemed to feel that the results might not be entirely beneficial if the government should sponsor the affair. Accordingly, a similar effort to bring about stabilization was set on foot through the American Construction Council of which Franklin D. Roosevelt is president.

Those participating in the meeting of the American Construction Council included contractors, building material manufacturers and dealers, bankers, architects, engineers, bond and insurance representatives, and labor leaders. The following recommendations were made: First—That banking interests curtail the financing of speculative building until after the close of summer. Second—That wide publicity be given to the increasing trend of construction costs both of labor and material. Third—That governmental, municipal and state construction departments be urged to delay their work as much as possible until September or October. Fourth—That the cooperation of newspapers and trade publications be sought to keep the public informed of the monthly increases in construction costs, and that they be requested to exercise their influence in curbing the demand for construction until the early months of fall.

The Construction Council's Report

The text of the report approved by the American Construction Council follows:

"The fear voiced some months ago by representatives of the construction industry, that the country's building activity was progressing at an over-rapid pace, and that soon this condition must precipitate a depression, is being borne out by developments within the industry today. Not only contractors, manufacturers and producers of the basic materials, but also leaders of labor have apparently come to realize that if the demand for new structures continues throughout the year at its present rate, production facilities, both in the basic industries and in the field operations of construction, will be inadequate, and that as a result of this condition the cost of construction will shortly mount to a prohibitive level.

"The opinion here expressed is based upon a number of factors, each pointing to the same conclusion, which may be outlined as follows:

"First—The volume of construction projected so far this year exceeds the volume of the same period of last year by more than forty per cent, and the experience of 1922 demonstrated that during that year the facilities for producing materials and conducting field operations were taxed about to the limit. Production in the basic materials is not only limited by the available supply of labor, but like other industries, by inadequate transportation. Construction likewise is limited by these factors and, in addition, the restricted supply of manufactured products and materials from the basic industries.

"Second—Stocks of materials on hand in practically all of the materials entering construction are lower than last year, while the unfilled orders are greater. Recent figures showed that orders on hand for common and face brick were about sixty per cent higher, and the stocks on hand, about sixteen per cent lower than in 1922. Orders on hand for bathtubs, lavatories, and other sanitary ware ran seventy-eight per cent higher and stocks on hand forty per cent lower than last year. From the construction field reports indicate that material sale men are slackening their solicitation of orders to a great extent and that manufacturers are, in many instances, unwilling to accept additional orders for any reasonable period to delivery.

"Third—Material prices are rapidly rising. Contractors in different parts of the country report that jobbers and manufacturers are unable to maintain their quotations for more than a day or two at a time on certain manufactured products; and it appears that the current demand has reached that stage where competition has passed from the seller to the buyer. The latter are bidding for materials and sending the prices upward. Furthermore, to aggravate the situation, deliveries are becoming uncertain, and recourse is being taken to the practice of over-ordering for the job.

"Fourth—Labor rates like the prices of materials, are rapidly increasing. In the building trades especially employers are placed in the position of bidding for services and paying bonuses to an extent in many instances even greater than in 1920. Regardless of what the different opinions may be as to the reasonableness of a wage fifteen or eighteen dollars per day, for skilled mechanics, we know that under present conditions these scales will soon stop building operations and leave the laborer in a more unfavorable position than he will occupy under steady employment at a lower wage.

"Fifth—The production capacity of various industries is limited and appears unable to meet a continuation of the present demand. Even where plant facilities are adequate, the output may be limited by labor and transportation, and in most of the basic industries sufficient expansion cannot possibly be made to care for the demand. Under these circumstances the manufacturer's influence on prices is very limited and a wide variation or spread takes place between his prices and the ultimate price to the consumer. This spread is already under way. It should be noted that to the credit of many manufacturers, they have not only shown a desire to hold their prices within bounds, but have actually succeeded in doing it to a great extent. Cement and steel are notable examples of materials in which factory price has been relatively stable. But after materials leave the hands of the manufacturer, and by the time they have reached the hands of the final consumer in a boom period, a spread of price occurs that bears little relation to the cost of production and distribution. Whether this is the result of speculation, local material corners, or merely the unbridled bidding of buyers, is a matter that should be ascertained and made known to the public.

The Inevitable Result

"No prolonged discussion of economics is necessary to point out the inevitable result of such a condition. A continuation of the present demand with its effect in raising prices will inevitably result before long in a curtailment of orders, decreased production, higher unit production costs and the entire gamut of the reactions of a depression. Downward price reaction, the liquidation and financial loss are consequences that must follow the lack of conscious action to stabilize the industry. In construction stabilization is probably more feasible than in any other industry as its demand is not transient but is cumulative; and in general, what is not built this season will serve as an outlet to production a year from now.

"On the side of labor a similar condition exists. The unduly high wages of

the present period must inevitably be followed by a reaction downward and a period of unemployment which will leave the laborer an annual, useful wage considerably less than that which he could obtain if adequate efforts were made to moderate the demand for construction.

"Considerable discussion has been devoted to the question of whether it is either possible or advisable to exert an effort to curb this demand and restrain inflation. The conclusion reached depends considerably upon special interests of the individual. It resolves itself finally into whether a large certain profit this season with its following depression is less to be desired than steady production with a continuing profit of moderate amount. At any rate there are several ways in which it is possible to exert an influence upon the situation.

"The various influences that can be set in motion may be segregated into two classes: first those that intend to increase production, and expedite materials to their source of consumption, and second, those that influence the demand for building projects. The first group may be outlined as follows:

"(A) By speeding up the production of materials and expediting field operations it is possible to a certain degree to offset the effect of excessive consumption. In some industries the possibilities from this source are limited, but in others requiring a plant outlay of moderate cost, some relief can doubtless be afforded. Construction companies can, to some extent, increase the efficiency of their management but it is possible that this will be necessitated anyway to offset the decreasing output of labor, which is again noticeable.

"(B) The speeding up of transportation is another factor that may furnish a certain amount of relief. Delays in transit, under-loading and holding of cars has practically the same effect as the curtailment of production. Experience of the past has demonstrated that both the mileage per car per day and the average loading of cars can be greatly increased by the exercise of care on the part of shippers. Therefore cooperation of shippers with the railroads will undoubtedly prove of benefit in relieving local shortages of materials.

"(C) There is also the question of restrictions to output on the part of local labor unions which has commonly been regarded as a useless practice so far as the welfare of labor is concerned, and a serious factor in the increase of construction cost. Elimination of these restrictions would exert a significant influence in holding cost below that point where building becomes uneconomical.

Publicity for Costs

"The second group of actions may be outlined as follows:

"(A) Through publicity of construction costs the public will be enabled to follow the trend of prices and restrict its demand at the point where investments at existing costs become economically unsound, thus avoiding the injurious effect of taking precipitous action when costs have risen to the limit. The investment in new structures at an index number approximating 200 will unquestionably prove unsound in many instances when general level of prices has declined. By informing the public of the index number from month to month it can govern its actions accordingly. It may be possible also to delay governmental, municipal, and state construction, until the peak of private building has subsided or until some curbing influence has been exercised on speculative building.

"(B) An influence on speculative building can be exerted by the banking interests of the country and they may find it decidedly to their interest to take such action. At the present time, daily newspapers are carrying advertisements of the banks which tend to encourage speculative building and aggravate the inflation of the construction industry. They are probably safe in lending for this sort of building at present, and until industry at large reaches that point of expansion where they consider it advisable to curtail loans. However, for the welfare of the construction industry, itself, a restriction of loans for speculative building at the present time or in the very near future, will produce a beneficial effect.

"(C) In some states the tax exemption on new homes is in force and this might be repealed until the rate of building slows down. It is very questionable whether the construction of a home at present prices is a sound investment for the average citizen. Moreover, in some cities the urgent needs are believed to have been filled, and a great part of the present activity is what might be designated as luxury construction.

"There are also certain other remedies of a miscellaneous character among which are the following:

"(A) Speculation and over-ordering of materials on the part of dealers and construction companies can be curtailed to a certain extent by the establishment of bona-fide material sale contracts obligating the buyer and sellers to mutually advantageous provisions. At present the buyer purchases with great apprehension that his shipments will be delayed by transportation or that they may be diverted to fill orders at a higher price and, as a result, he orders more than his work actually requires. The effect of this practice is to build up a false demand that has an inflating influence on prices.

"(B) There is, of course, a vague possibility of controlling the situation to some extent through the steadying of prices by dealers and the steadying of wages by labor. If any relief is to be derived from this source, it will probably have to come as the result of mutual agreements between contractors, the building trades and those concerned with the handling of materials. Just as it has been the custom and the right of vendors to accept as much for their products as the buyer is willing to pay, so we may expect mechanics and laborers to be guided by the same policy. It is possible, however, that in local communities agreements may be made between these elements to lend their efforts in preventing runaway costs in construction.

Some of the actions here mentioned are sound enough in economic theory, and if they were attempted in earnest by all the parties involved in construction would doubtless produce the desired result, but it is questionable how far the necessary cooperation can be made to extend. There is, however, one influence that can be brought to bear effectively upon the situation—namely, the cooperation of the country's editors. If these men will publish the index number of construction for the country or for any particular locality and call the attention of their readers to the rising trend of construction costs, it is highly probable that they can effectively influence the demand. They may in this manner bring about a conscious steadying of the market that will avoid too much inflation.

"In other words the choice lies open as to whether through some such action as is here mentioned the public chooses to control its demand while the price is at its present level or whether it prefers to exercise no influence on the course of events, and thus allow the industry to culminate in another period of stagnation, deflation and unemployment.

"In view of the facts that have been brought to light in the present building situation it is recommended:

"First—That banking interests curtail the financing of speculative building until after the close of summer.

"Second—That wide publicity be given to the increasing trend of construction costs both of labor and material.

"Third—That governmental, municipal and state construction departments be urged to delay their work as much as possible until September or October.

"Fourth—That the cooperation of newspapers and trade publications be sought to keep the public informed of the monthly increases in construction costs, and that they be requested to exercise their influence in curbing the demand for construction until the early months of fall."

Henry Woodland Is Dead

Henry Woodland, secretary and treasurer of the Allis-Chalmers Manufacturing Company, died suddenly at his home in Milwaukee on Monday, May 14th.

Born in Utica, N. Y., Mr. Woodland at an early age became connected with the New York Air Brake Company of Chicago. Later he was treasurer of the Gates Iron Works of Chicago. When in 1901, this company was taken over in the consolidation which formed the Allis-Chalmers Company, he became assistant treasurer of the new organization and afterward its treasurer. In 1916, he was elected secretary and treasurer of the company. At the time of his death, he was also vice-president and a director of the Hanna Engineering Company of Chicago.

A man of striking personality, keen judgment and extraordinary business sagacity, it was, however, Mr. Woodland's kindly, genial nature, his quick sympathy and warm friendliness which so endeared him to the host of friends who mourn his death.

The German method of transporting concrete poles one hundred and thirty feet long.

Concrete Poles for Swedish Power Line

By F. A. Brackmann

Concrete poles produced by the centrifugal process, and in various designs and shapes are being brought on the European market. The greatest field for them is in the electric industry, where they are used for the carrying of telegraph wires, and transmission lines conveying high current from the power stations to the consumers miles away.

One of the largest power transmission lines of this kind forms a connection between south and central Sweden from the works at the Trollhaettan falls to Vaestreros in Sweden, northwest of Stockholm. It was built for transferring the surplus energy from the Trollheattan falls to the station at Aelfkarleby, especially during the winter, when the water of the Dalaelfs is insufficient to produce the energy required. The line is about 200 miles long, and is carried on hollow reinforced concrete poles. It transmits at present a current of 110,000 volts. It is intended to increase the voltage to 240,000 later on. Altogether 800 poles were used and erected in pairs. The first few hundred were connected by iron transverse beams, but in view of the favorable experiences made in the course of construction with the concrete poles, reinforced hollow beams were later used.

These carry two cables between the poles and two at the ends outside. Because of the changing local conditions along the line, and the variations in the load from 1,200 to 1,400 lbs., four different sizes were made from fifty-six to fifty-nine feet in length, and a diameter from nine to ten inches at the top and from eighteen and five-tenths to twenty-three inches at the bottom. The average thickness is about two inches. Nearly six per cent of them were tested, and some of them, about one per cent the whole number, were subjected to bending stresses till fracture occurred.

The Stipulated Tests

It was stipulated, that the latter had to stand at least four times the highest ultimate load at the top. The others had to be subjected to double that load without showing any cracks or alterations of form. The tests proved, however, that the poles were exceedingly elastic, and could carry six to eight times the highest ultimate top load. During the tests the load was taken off several times, and the top went almost completely back into its original position, showing that the bending was of an entirely elastic nature. Even after fracture had occurred the steel reinforcement was still able to stand considerable stress as it had only slightly been damaged. In some cases when the breaking stress had been reached, cracks from the tensile stress outside the bent, and signs of excessive pressure inside the bent appeared at the same time, which shows that the tensile stress which centrifugal concrete will stand, is considerable above the usual norm for concrete. Some of the poles, sixty-four feet long, being subjected to a bending stress of 7,300 lbs., bent seven and one-half feet at the top without any signs of damage. The poles were tested at an age of six to seven weeks. It had also to be proved that their earth connection, which was brought about by attaching contact pieces to the steel reinforcement, was perfect, and that the electric resistance was less than 0.2 ohm.

Ornamental railway pole.

The poles and the transverse beam are connected by reinforced concrete sockets. The sockets have the form of a bearing and consist of two halves. After the poles are erected, the bottom halves of the sockets are set right upon the poles, and filled in with cement. Then the transverse beam is laid in, and the top halves of the sockets are screwed down. The recesses for the nuts and the ends of the bolts are also filled in with cement to prevent rusting, and the whole structure forms a complete unit. For the erection and for the fitting of the sockets and cross beam, small iron appliances with a platform and with overhead pulleys are screwed to the poles. The pulley is used for hauling up the cross beam, the socket, and the material. After the completion of one structure these appliances are taken down and used on the next.

Of the poles and the beams which were manufactured at the works of a German firm at Cossebaude near Dresden, two-thirds were transported by rail the whole way, via the ferry Sassnitz-Trelleborg, and the rest were shipped by lighters from Stettin. Considering the great stresses to which the transport subjected them, it speaks well for their quality, that all arrived in first class condition.

Manufacture Described

The poles are manufactured in a wooden mould, which is revolved in a special machine. The mould consists of two half round forms, and is lined with sheet iron inside.

The reinforcement is formed by rolled rods, of open hearth material, going lengthwise, which are interwoven with three spirals of wire one within the other. It is wound upon a special automatic machine, so that the uniformity in their measurements and in the strength of the poles is assured. The spirals influence the fracture stress comparatively little, but they determine to a certain extent the rigidity of the pole, and by

using three spirals it has been possible to reduce the bending to one-half per cent of the length at the normal load, and to one and a half per cent at the double load. In order to give the maximum strength to the pole, care is taken that the reinforcement comes as close as possible to the circumference, and is at an equal distance away from it. Small slabs of concrete are therefore fitted to the outside of the reinforcement to keep it in the proper position within the mould. The cement mortar is mixed in proportion of one to three, and some asbestos fibre is added to assist in holding sand and cement together.

After the wire structure and the cement have been put into the mould, this is closed, and put into the machine, according to the diameter of the pole, it is then revolved at a speed of 500 to 1,000 revolutions per minute. This high velocity, which is attained immediately after starting, and the continued revolution at the same speed are necessary to prevent a decomposition of the mortar, which would take place on account of the different specific gravities of sand and cement. The excessive water in the mortar accumulates in the hole in the centre, and in striking the wall of the pole during the revolving, increases the compactness of the grain. The fear that the cement would be thrown to the outside, and that the mixture would become less rich towards the centre have been proved unfounded.

The centrifugal arrangement consists of several machines which are lined up one behind the other. Each machine has two strong side frames with a large centre bore. Inserted in the bore is a tube which rolls freely between six wheels. These wheels are carried by three shafts which may be adjusted radially in relation to the bore. The tube is fitted with a self centering chuck for holding the wooden mould. All machines are driven from a main shaft, the centre tube serving as a pulley. After revolving the mould in the machines for about ten to fifteen minutes it is taken out, the lid at the end is removed, and the water is poured out of the centre. The pole is left in the mould for one to two days. It has then set sufficiently to be taken out, and is kept in moist sand for about three to four weeks. The centrifugal process has been used advantageously in the production of poles and candelabras of various forms.

The machine used in making hollow spun poles.

Cement Statistics for April

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for April, 1923, were made necessary by the lack of returns from two producers.

Production, shipments, and stocks of finished portland cement, by districts in April, 1922, and 1923, and stocks in March, 1923, in barrels.

Commercial District	Production April 1922	Production April 1923	Shipments April 1922	Shipments April 1923	Stocks at end of April 1922*	Stocks at end of April 1923	Stocks at end of Mar., 1923*
Eastern Pa., N. J. and Md.	2,568,000	2,996,000	2,529,000	3,554,000	4,306,000	3,778,000	4,336,000
New York	434,000	514,000	470,000	624,000	1,000,000	804,000	914,000
Ohio, Western Pa., and W. Va.	801,000	1,145,000	701,000	1,247,000	1,396,000	1,042,000	1,144,000
Michigan	476,000	551,000	420,000	598,000	812,000	624,000	671,000
Illinois, Indiana and Ky.	1,398,000	1,924,000	1,228,000	2.405,000	2,542,000	1,304,000	1,786,000
Va., Tenn., Ala. and Ga.	566,000	573,000	535,000	635,000	518,000	213,000	275,000
Eastern Mo., Ia. and Minn.	1,055,000	1,018,000	781,000	1,197,000	1,834,000	1,692,000	1,870,000
Western Mo., Neb., Kan. and Okla.	526,000	855,000	554,000	940,000	856,000	884,000	968,000
Texas	290,000	360,000	278,000	347,000	344,000	285,000	272,000
Colorado and Utah	173,000	245,000	161,000	218,000	170,000	163,000	136,000
California	697,000	917,000	741,000	924,000	332,000	139,000	146,000
Ore., Wash. and Mont.	259,000	261,000	194,000	265,000	360,000	522,000	527,000
	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	11,450,000	13,045,000

*Revised.

Stocks of clinker, or unground cement, at the mills at the end of April, 1923, amounted to about 5,007,000 barrels compared with 5,174,000 barrels (revised) at the beginning of the month.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in January, 1923, amounted to 71,686 barrels, valued at $118,631. The total imports in 1922 amounted to 323,823 barrels valued at $628,846. The imports in January were, from Denmark, 61,123 barrels; Canada, 7,471 barrels; Belgium, 2,532 barrels; Norway, 560 barrels. The imports were received in the following districts: Porto Rico, 46,641 barrels; North Carolina, 19,064 barrels; St. Lawrence, 2,889 barrels; San Francisco, 2,532 barrels; Massachusetts, 560 barrels.

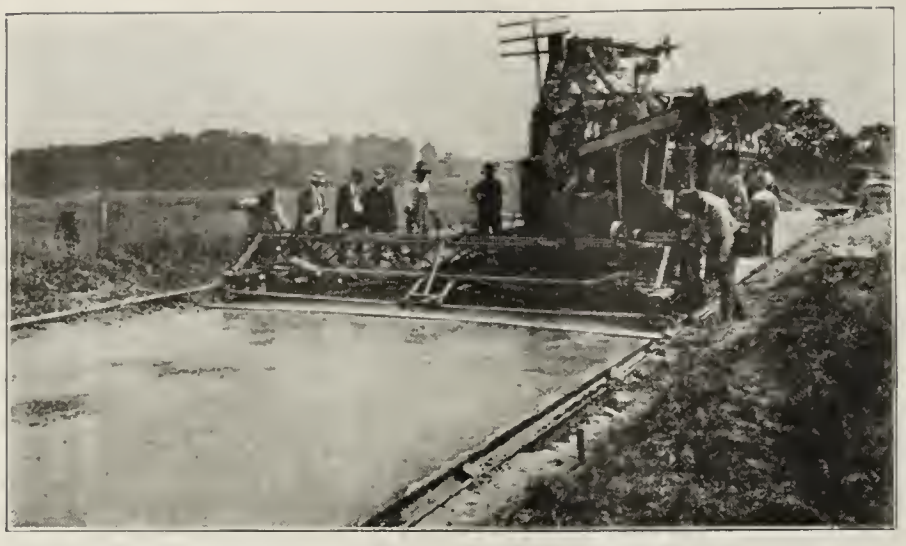
Imports and Exports of hydraulic cement, by months, in 1922 and 1923,(a)

Month	Imports (barrels) 1922	Imports (barrels) 1923	Exports (barrels) 1922	Exports (barrels) 1923
January	17,039	71,686	70,725	73,169
February	5,157	(b)	82,421	88,624
March	1,597	(b)	103,556	98,861
April	10,855	(b)	75,412	(b)
May	2,524	.....	100,068	.....
June	14,198	.....	96,263	.....
July	957	.....	119,491	.....
August	56,757	.....	105,156	.....
September	c42,641	.....	78,615	.....
October	d65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823	.....	1,127,845	.....

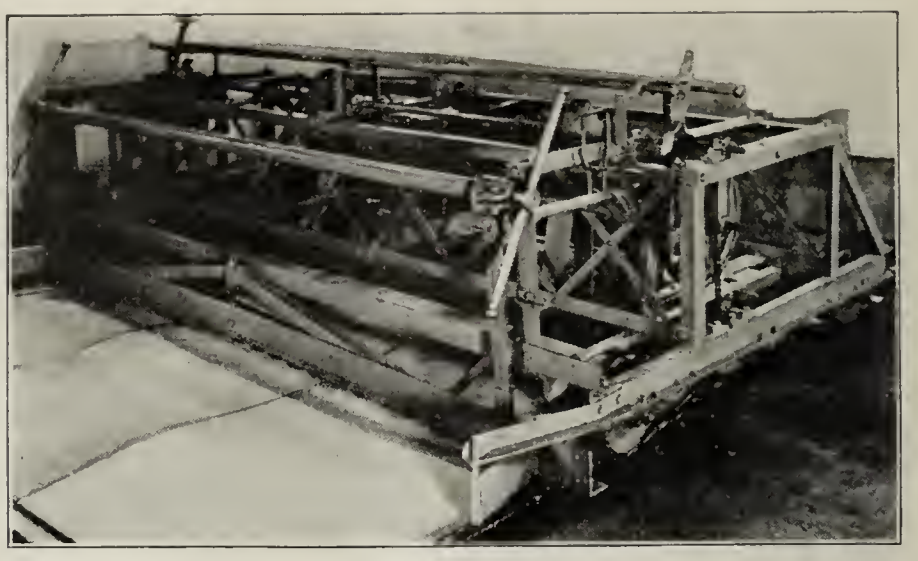
(a) Compiled from records of the Bureau of Foreign and Domestic Commerce. (b) Imports in Feb., Mar., and Apr., 1923, and exports in Apr., 1923, are not available. (c) Imported during period Sept. 1-21, inclusive. Imports during period Sept. 22-30 are included with Oct. (d) Includes imports during period Sept. 22-30.

The exports of hydraulic cement in March, 1923, were 98,861 barrels, valued at $284,561, of which was sent to Cuba, 52,374 barrels; to the other West Indies, 6,601 barrels; South America, 25,031 barrels; Central America, 6,098 barrels; Mexico, 6,095 barrels; Canada, 866 barrels, and to other countries, 1,796 barrels. The total exports of hydraulic cement in 1922 were 1,127,845 barrels, valued at $3,206,201.

The new improved form of gelatin recently placed on the market by the Atlas Powder Company is reported from all sections where it has been used as giving extraordinary results. Not only in its all-around efficiency as an explosive, but in respect to the negligible amount of fumes evolved. A resident engineer on a large tunnel operation, reports that, "his men could return to work in 12 to 18 minutes, while with old style Gelatin it required at least 30 minutes before the men could return, and then they could not stay." In addition to these advantages, the manufacturer of this new explosive advises, that it is extremely high in water resistance and also, practically perfect in plasticity—two properties that are of extreme importance in most underground operations, where wet work is often encountered and where loading in upward or pitching holes is necessary so frequently.



The new hand operated tamper at work.



Motor powered road tamper.

A New Road Tamping Machine

Highway engineers will be much interested in the new hand operated machine which is being put forth by the Heltzel Steel Form & Iron Company of Warren, Ohio. The subject of the illustration is one of these machines operating on armor plate road forms which are made of steel 3/16 of an inch thick with a six inch bottom flange made by the same company. This machine has been successfully tried and has the endorsement of several state highway engineers. It is made entirely of steel with the frame work rigidly reinforced in order to adequately support the drive shaft. On the drive shaft cams are fastened which serve to lift the roller that is attached to the strike off. The action gives a vertical as well as a lateral motion which gives the correct crown to the road.

In the front of the machine is a steel strike off, back of which is the tamper proper, another strike off is back of the tamper. This serves to catch any unevenness which might have been passed by the preceding members. The final member is a wood finishing plate. All of these members operate from the turn of the crank handle. The crank shaft transmits power to a pair of wheels on each end of the machine upon tracks that limit and confine the concrete road bed. The machine can be moved forward or backward as necessary and adjustments are allowed if the various members lose the crown given them.

The other illustration shows a motor driven finisher. This is an improvement upon the hand machine and the power in this case is derived from a 1½ h. p. Hercules engine. Either the hand or motor driven machine can follow the largest paver operated to full capacity. The feature of this machine is that the tamping members do not strike the road forms, the shock being absorbed by a spring stop. This tamp member is cut to the width of the road and does not hit against the steel road forms. The machine is sturdily constructed and has no vibration. If the gasoline motor for any reason cannot operate, the machine can immediately be turned into a hand operated machine as the gear reductions are such as to make the operation by hand very easy.

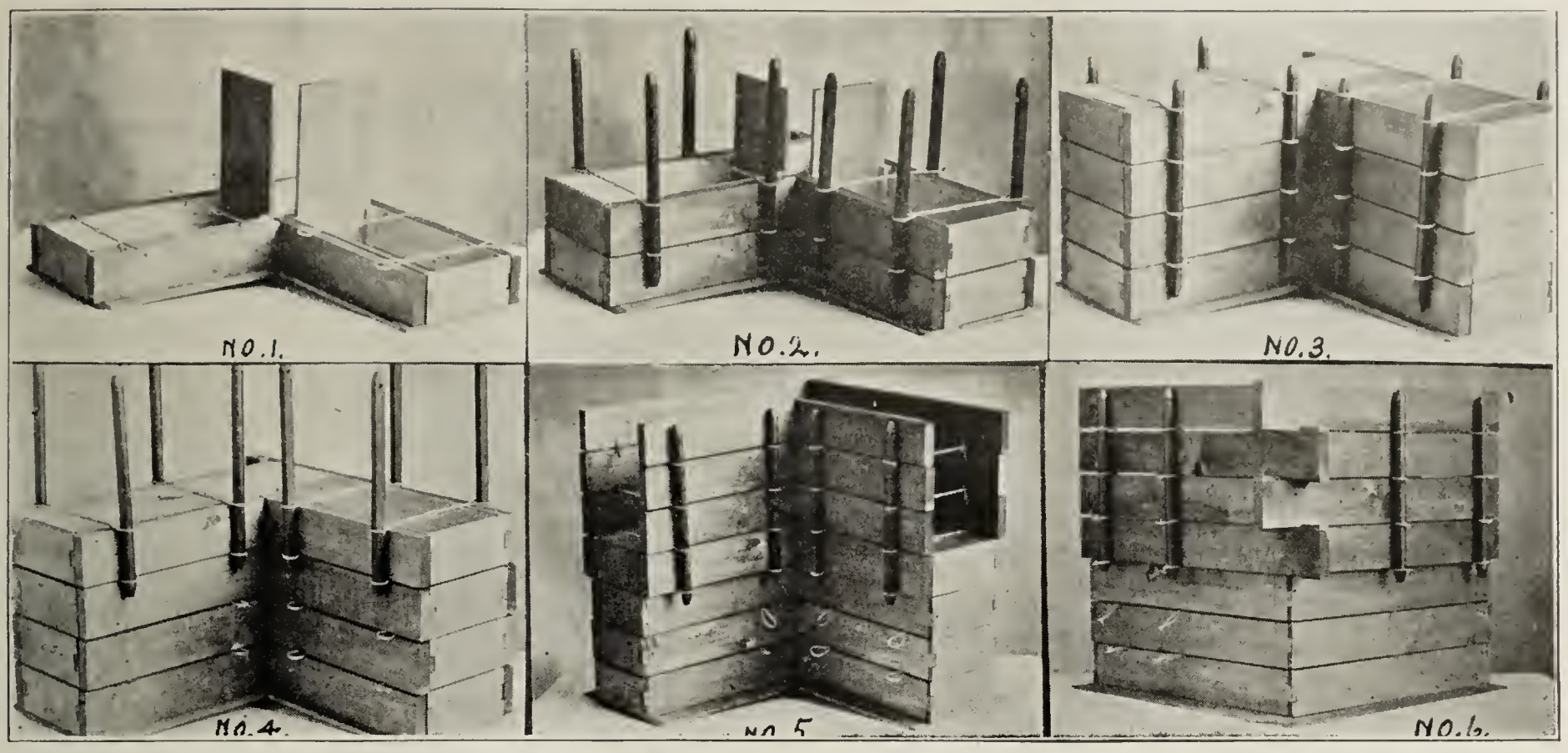
Righting a Grain Elevator

A striking example of the strength and practicability of reinforced concrete is afforded in the subject illustrated. This structure was built about ten years ago and is a one million bushel grain elevator belonging to the Canadian Pacific Railway located near Winnipeg. It consists principally of a work house seventy feet by ninety-six feet and one hundred and eighty feet high, and a bin house seventy-seven feet by one hundred and ninety-five feet and one hundred and two feet high. The latter is made up of sixty-five circular bins fourteen feet four inches in diameter. These bins and diamond shaped bases between them afford a storage capacity of approximately one million bushels. The structure rested on a floating foundation of reinforced concrete. The supporting mat for the work house was fifteen feet below prairie level. For the bin house it was twelve feet below, resting on a firm gray clay with a depth of about forty feet. Tests showed that the clay should safely carry a load of from three to four tons per square foot. The ultimate loading of the clay under the mat was calculated for this structure to be three and three-tenths tons per square foot and it was estimated that there would be no difficulty after the initial settlement.

The Canadian Pacific Railway began storing grain in the Transcona Elevator in September, 1913. Care was taken to fill the bins so that the load would be uniformly distributed. On October 18, with 875,000 bushels in the bins, settlement was first noted and a vertical settling of one foot took place within an hour. Within twenty-four hours, the bins had leaned to the west twenty-seven degrees. The lower side was twenty-nine feet below its original position and the higher about five feet above its original position. Only the upheaval and compacting of the soil on the west side prevented the complete overturning of the structure, which in fact was found to be in a most hazardous position with its center of gravity dangerously near the lower edge.

The Foundation Company of New York undertook to right the elevator. The grain was reclaimed from the bins by tapping them through the sides and when the company commenced the work the structure which weighs 20,000 tons was emptied. Owing to the strength of the concrete construction the bin house was not materially damaged by this rough treatment. In salving this structure the problem was not only righting the bin but the sinking of piers to the bed rock fifty-five feet below prairie level. All this happened in 1914 and the structure today is one of the efficient units on the Canadian Pacific System.

These concrete cylinders were listed twenty-seven degrees.



New Movable Forms for Concrete

An invention covering concrete forms which may interest contractors has been patented by Chas. Suiter, Red Lodge, Montana. It is claimed for this invention that it will reduce materially the cost of the forms into which the wet mixture of concrete is poured.

A number of devices have been patented for this purpose, nearly all of them having points of merit. This is especially true of forms for floors such as flat slab and concrete joist constructions. It is claimed that up to the present time there has been little or no reduction in the cost of forms for hollow or monolithic concrete walls.

The inventor is a practical contractor, who in his attempt to reduce the cost of construction noted the expensive wastage of material used in the forms for concrete. In analyzing these costs it developed that a form for an average foundation cost about fifteen cents per square foot, skin surface, of concrete after deducting the full value of the salvage. This conclusion was tested by actual demonstration which brought forth these considerations; that lumber, the most universally available material, is the most economically adaptable to the ever changing forms of concrete; to increase the value of the salvage the lumber used in forming must be placed without the use of nails; this lumber must be easily released for re-use or salvage.

With this idea in mind the invention as illustrated above was evolved. No. 1, shows the form boards in place outside of a built up core (the core represents concrete). On top of the form boards are placed wire ties spaced apart as required by the thickness of the form lumber and the height formed to be poured at one time.

No. 2, shows the second tier of form boards with the core in place. The wire ties across the top of the form boards immediately above and perpendicular to the wire ties below. At this point in the erection of the form, steel rods flattened on one side are inserted through the loops of the wire ties projecting past and outside of the form boards and are then turning to a locking position (that is with the long diameter of the rod turned to the form board). The length of the wire ties is determined by the thickness of the concrete wall to be poured.

No. 3, shows the first set up of the form completed and the concrete poured.

No. 4, shows the steel rods raised to receive the second set up of the forms. In this case the rods as shown in the picture No. 3 have been turned to a release position, that is, with the flattened side of the rod or the short diameter towards the form board and have then been raised through the loops of the wire ties and turned in the top two ties into a locking position thus fastening themselves and the top boards of these forms to the concrete wall. When the release rods have all been raised into this position the form lumber below the top boards is released for re-use.

No. 5, shows the salvage lumber raised and placed above the poured concrete wall ready for the new pouring of concrete.

No. 6, shows how the outside corner of the form is locked and supported in position by weaving the form boards, each form board having a cleat that is longer than the width of the board fastened near the end and across the board, the projecting ends of the cleats supporting the edges of the form boards above and below.

It is claimed for this method of forming that the first set up of the form requires the use of only one-half of the lumber that would be required to form the same number of square feet, skin surface, of concrete as by present methods; that the labor cost per square foot of form for the first set up is less than one-half of the cost of present methods; that there is no additional lumber used in the second, third, fourth or any number of changes of form; that the labor cost of the change of form from position below to position above is about one-quarter that of forming the same number of square feet by the present methods; that the wire ties being machine made and prepared in advance will cost about one-quarter as much as the current method of tying; that the lumber used in these forms can be treated by first kiln drying and then having the sap pores filled under pressure with silicate or creosote. Lumber so treated will absorb little or no moisture from the concrete and it will have less tendency to warp, cut, split or become brittle. In this manner the lumber can be taken to and from the job the same as a concrete mixer or any other piece of equipment.

A New Experiment Station

WASHINGTON, MAY 28.—Rutgers College, New Brunswick, New Jersey, has been designated by Secretary of the Interior Work as the location of a new mining experiment station of the Bureau of Mines, which will specialize in problems involved in the production and utilization of non-metallic minerals. About seventy-five per cent of the industries consuming the non-metallic minerals production center in the large industrial cities and are within easy reach of Rutgers College.

These minerals include cement, clay, feldspar, Fuller's earth, bauxite, graphite, gypsum, lime, mica, phosphate rock, salt, sand and gravel, sand-lime brick, slate, stone, sulphur, mineral paints, garnet, asbestos, and talc. The value of these non-metallic minerals produced annually in the United States is in the neighborhood of a billion dollars.

The choice of Rutgers College was determined largely by the fact that its location is a central one with reference both to the production and consumption of non-metallic minerals. The adjacent state of Pennsylvania alone has one and seven-tenths times as great a production of non-metallic minerals as all the states south of the Potomac and Ohio rivers combined. The New England and North Atlantic states, which are readily served from New Brunswick with a minimum of travel, have a combined non-metallic output of approximately three and one-half times that of all the states south of the Potomac and Ohio rivers.

W. C. MacDowell, formerly manager mining sales department, power and mining machinery works of the Worthington Pump & Machinery Corp., has accepted the position of general sales manager of the Traylor Engineering & Manufacturing Company, of Allentown, Pa.

News of the Cement Mills

An immense new corporation has been formed under the name of the Arkansas Valley Portland Cement Co., with a capital stock of $3,000,000, by residents of Florence and Denver, Colorado. According to a telegram published in the Citizen, the company intends to locate a big plant east of Concrete which will employ 150 men.

Marquette Cement Mfg. Co., Marquette Bldg., Chicago, Ill., has purchased the Cape Girardeau Portland Cement Co., at a reported price of $2,000,000 it was announced today. The plant operates with a daily output of twenty-five cars of cement, employs 200 men on day and night shifts.

The Yosemite Cement Co., Mariposa, Mariposa County, Calif., has filed on lands located at Jenkins Gulch along the Merced River, and contemplate erecting a plant with up-to-date machinery. Machinery for the plant has been purchased and the contract for the construction has been awarded to the Hunt Engineering Co. of Kansas City, Mo. The company will also manufacture lime which will be purchased by the Agricultural Lime Composit Co. of San Francisco.

San Antonio Portland Cement Co., San Antonio, Texas, has recently let a contract to Kroeger & Kroeger to erect plant addition. Williard E. Simpson is the engineer.

Word has come from Wilmington, Delaware, that the Kerr Portland Cement Co., Wheeling, W. Va., has been recently incorporated with a capital of $3,000,000.

The Board of Directors of the Michigan Portland Cement Co., on April 6th, elected Mr. N. S. Potter, Jr., as president to fill the position formerly held by his father, Mr. N. S. Potter, Sr., deceased.

Newaygo Portland Cement Co., Newaygo, Mich., has increased its capital stock $945,000 to $1,695,000.

The Southeastern Portland Cement Co., Macon, Georgia (recently noted), will break ground within 60 days for its new cement mill to cost $1,000,000 with equipment. W. Jordan Masse, well known brick manufacturer, is president.

The Santa Cruz Portland Cement Company is doubling the capacity of its big plant at Davenport, California. The company's cement mill, which is the largest on the Pacific Coast, will be in full operation within the next sixty days, the transfer of the machinery from the Standard Portland Cement Company's plant at Napa Junction, the Santa Cruz Company purchased at the close of the war, having just been completed. The decision to increase its plant capacity was warranted by recent surveys and reports by the company's engineers which show that it has an ample supply of limerock for the next fifty years. More than 500 men are now employed in putting the finishing touches on these extensive additions and betterments.

In a recent issue of the Birmingham, Ala., *Age-Herald* it is stated:

"In the past few days the Phoenix Portland Cement company has started its new $3,000,000 mill in East Birmingham and in a week to 10 days will be turning out cement for the trade.

"This mill has an annual capacity of 1,500,000 barrels a year. It starts at a time when there is a maximum demand for cement for road, factory, skyscraper and store building, and will have no difficulty in disposing of its product as fast as it is made.

"The company purchased a site at Tarrant City last summer and dirt was broken on the plant in September. It has made record speed in construction.

"The Lehigh Portland Cement company expects to have its new 1,500,000 barrel mill near Tarrant City completed by August 1, probably a little before. The construction of this plant is all steel and concrete, and it is to be fireproof throughout.

"The Lehigh mill is the sixteenth of Lehigh mills. It has 15 plants in other parts of the country, and is one of the largest producers in the world, with headquarters at Allentown, Pa.

"The Birmingham mill is to supply the trade of the southeast, where the demand is several times the production of the southern mills.

"The Lehigh company has opened sales offices in the Woodward building, with Frank Traynor in charge. The next nearest sales office is in Richmond, Va.

"With the coming in of the Phoenix mill Alabama has a cement producing capacity of about 4,000,000 barrels a year, the other mills being those of the Atlas at Leeds, the Gulf States at Demopolis on the Warrior, and the National at Ragland. All mills are operating at capacity and making record shipments of material."

Shareholders of the Oregon Portland Cement company at a special meeting May 8th, ratified the action of the directors last month in recommending that one-tenth of the $875,400 of 7 per cent preferred stock be redeemed at 120 as of May 9, which would carry with it payment of dividends to that date.

This action is dictated by business prudence, it is said, because the book value of assets this year will fall below the face value of the preferred stock, on account of heavy depreciation and depletion charge advisable to be written off.

Ultimately, if the announced policy is followed, all of the preferred stock will be redeemed and only the common stock outstanding will represent the company's capital. The 20 per cent in arrears on dividend payments to bring them to date, but with another favorable year the arrears will have been cut down perceptibly.

The Interstate Commerce Commission has suspended from May 15 until September 12 next, the operation of schedules proposing the cancellation of through carload rates on cement from Continental and Prospect Hill, Mo., to Louisville & Nashville Railroad stations in Illinois, the effect of which will be that shipments from those points to local stations on this carrier in Illinois will be assessed switching charges in addition to the St. Louis, Mo., rate, which is at present applicable from those points without the addition of such switching charges.

O. J. Binford, secretary and superintendent of the Southwestern Portland Cement Co., 613 Two Republics Bldg., El Paso, Texas, writes us as follows: "It is true we are going to build a plant at Fort Worth under the direction of our own engineers. It will be a wet plant of from 2500 to 300 barrels capacity but we are not ready yet to give out the full information concerning the equipment as the equipment has not been fully decided upon."

The San Joaquin Portland Cement Company, San Francisco, Calif., will build a cement plant to cost in the neighborhood of $1,250,000 to be established at Exeter, Tulare County, Calif., in the marble Mountain region. John F. Humburg, manager Hackfield Company, Ltd., will head the company which already owns immense deposits in above place. The plant will have a daily capacity of 2,000 barrels of wet cement. The company also expects to manufacture lime. The company has been incorporated for $4,000,000.

Cement Prices

According to a report issued by the Department of Commerce, Division of Building and Housing of Bureau of Standards, the following table shows average prices paid April 1, 1923, by contractors for building materials on the job. These prices were secured by the Bureau of Census.

	Barrels
Pittsburgh	$3.10
Erie	3.60
Cleveland	3.48
Akron	3.50
Toledo	3.68
Lorain	3.60
Newark	3.50
Dayton	3.60
Hamilton	3.20
Baltimore	3.50
Washington, D. C.	3.30
Richmond	2.85
Columbia	4.00
Savannah	3.85
New Orleans	3.20
Shreveport	3.60
Detroit	3.72
Bay City	3.25
Saginaw	3.60
Waterloo	3.00
Council Bluffs	3.10
St. Louis	2.85
Kansas City	2.90
Grand Forks	3.80
San Antonio	3.60
Tucson	4.28
Sacramento	3.55
Los Angeles	3.70
Portland, Ore.	3.40
Fitchburg	3.00
Haverhill	3.40
Fall River	3.24
New London	3.68
Poughkeepsie	3.30
Albany	3.47
Schenectady	3.10
Rochester	3.35
Buffalo	3.03

April Construction

The rate of increase in building operations showed signs of slackening in April, according to F. W. Dodge Corporation. The increase over March in 36 eastern states was only 7%, whereas April normally shows an increase of 15% to 20% over March. In view of the enormous volume of operations started since the first of this year, this slowing down of the seasonal rate of increase is a wholesome sign.

Total contracts awarded during April in the 36 eastern states amounted to $399,243,000. In 27 of these states, the record shows an increase of 1% over April of last year. Construction started from January 1 to May 1 shows an increase of 15% over the corresponding period of 1922. On April 1, the record showed an increase of 23% over the corresponding period of last year.

News of the Concrete Products Factories

The Merrit Pipe Company of Santa Clara, Calif., has recently purchased new machinery for the manufacture of concrete sewage pipe, concrete culverts, concrete conduit pipe, drainage pipe and concrete burial vaults.

The Concrete Products Company of Houston, Texas, has just completed the installation of one of the most up-to-date trim stone plants in the South.

C. H. Daugherty of Lexington, Ky., has sold his concrete construction business to Samuel Watson, of Danville, Ky.

The Leeds Concrete Products Company's new plant at Leeds, Alabama, will be ready for business in the near future.

The Concrete Products Corporation of Astoria, Oregon, has erected several large buildings, installed new machinery and is turning out a large quantity of tile and brick.

Claus H. Light, Garden Grove, Iowa, wants prices and catalogs on concrete block machine and a mixer.

The Leeds Concrete Product Co., Leeds, Ala., has its new plant ready for operation and will manufacture brick, tile and sewer pipe.

The Concrete Products Co., Stemmers Run, Baltimore Co., Maryland, has been recently incorporated with a capital of $50,000 by Malcolm T. Douglass, F. Harry Hengemihle, Harry W. Shenton.

The Economy Concrete Co. of Va., Inc., South Richmond, Va., has been recently incorporated with a capital of $100,000 by J. Scott Parrish, Pres., J. S. Archer, Secy. They have a five-acre site on which it let contracts for construction of a steel and concrete building. Intend to install rock crusher, concrete mixer, electric cranes. Daily output is expected to be one to two carloads decorative concrete stone.

The Galien Concrete Tile Co., Galien, Mich., has increased its capital stock from $5,000 to $20,000.

The Reddog Products Corp., Bessemer Bldg., Pittsburgh, Pa., will erect a plant costing more than $75,000 with machinery.

The East Side Coal & Supply Co., Altoona, Pa., will erect a plant for the manufacture of concrete products.

The Concrete Building Tile Corp., Mt. Kisco, N. Y., has been recently incorporated with a capital of $100,000 by G. C. Hoffman of Mt. Kisco.

The Colonial Concrete Products Company, W. S. Shapiro, Pres., Caton ave. and Kingsley st., Baltimore, Maryland, operate a Jewell Supply & Equipment Co. block machine and Anchor brick machine. Wants prices and catalogs on mixers. Writes us as follows: "Do you know of any good waterproofing for integral mixing so as to raise the price of brick too much."

The Corbin Concrete Construction Co., Corbin, Ky., has been recently incorporated by C. S. Barnes, John Glara and H. M. Dunn.

The Wilmington Pottery Co., R. L. Linker, president of Charlotte, N. C., has been recently organized at Wilmington, Delaware. R. H. Young of Charlotte, N. C. is secretary. It has acquired site and building at Wright and Surrey Sts. on which it will established plants for manufacture of concrete products, including park benches, flower boxes, blocks, jardinieres, building trimmings, etc.

The Willey-Rickstuhl, Westwood, Cincinnati, Ohio, writes us that they contemplate manufacturing concrete products such as tile, brick, blocks, etc. and want prices and catalogs on same kind of machines.

The East End Sand & Gravel Company, East Main st., Chillicothe, Ohio, writes us that they contemplate manufacturing concrete products such as tile, brick, blocks, etc. in the near future and wants prices and catalogs.

The Cement Products Mfg. Company, Roanoke, Va., has been recently incorporated by E. H. Pearl, Pres., and E. A. Buchanan, Sec'y and writes us that it is in the market for machines to manufacture brick, building blocks and burial vault molds.

The Edwards Fyfe Company, Kennewick, Wash., operates a Blystone mixer and building wall tile machine. Wants prices and catalogs on machines for making floor tile, culverts, drain tile, septic tanks, fence posts and brick. Also interested in mixers, truck conveyors, sack cleaner, cement sack baler, mica spar crystals and marble chips.

The Winebrener-Olson Company, Long Beach, Calif., has just filed with the secretary of state articles of incorporation. The concern is capitalized at $25,000. It will engage in the manufacture of cement products. The incorporators are Victor M. and M. N. Winebrener and Chris Olson all of Long Beach, Calif.

The Acme Tile Mfg. Company, St. Petersburg, Florida, has been recently incorporated with a capital of $25,000 by Harry Forkel, Pres., Robert Arnold, Sec.-Treas.

The W. P. Brenner, Carthage, N. C., wants prices and catalogs on brick machines to make 25,000 to 30,000 brick daily, f. o. b. Carthage.

M. G. Hamilton, who has had a number of years of experience in concrete work, is to open a block factory in Burlington, Kansas. He has ordered the machinery, and has rented the old electric light building on the Wabash right-of-way. He expects to have the plant in operation at an early date.

J. M. Caldwell has begun a cement brick manufacturing plant at Silverton, Ore. Mr. Caldwell reports that he has found gravel near Silverton which he can use profitably and that he can make the bricks in thirty-eight different colors.

Between $15,000 and $20,000 has been spent recently in improvements and additions to increse the capacity of the Acme-Brick plant in Denton, Texas, according to A. B. Kelly, manager.

He made this announcement in connection with the statement published in Fort Worth, where the headquarters of the Acme Brick Company is maintained, to the effect that the company has been consolidated with the Fort Smith Brick Company and the capital stock increased from $650,000 to $1,050,000. Four plants, in Denton and Bennetts, Texas, and Fort Smith and Perle, Ark., are now to be operated by the company.

The improvements recently completed in the Denton plant include the installation of a combination mud brick and tile machine which has a capacity of 100,000 brick per day or about 25,000 pieces of tile. The plant already had a capacity of 50,000 pressed brick a day, and can now turn out 150,000 brick daily.

The plant is now making about 60,000 brick per day and the manager has not had definite instructions yet as to increasing the output. During this month, however, about 1,500,000 brick are being shipped out, which is the largest month's shipment in almost a year, according to Kelly.

Link-Belt Changes

The Link-Belt Company of Chicago and Philadelphia announce that Mr. L. M. Dalton has succeeded E. J. Burnell as manager of the Boston branch office. Mr. Dalton's appointment comes as a reward for merit shown, he having shown himself in the past an able and competent engineer. Mr. Burnell resigned his post to enter business for himself and he carries with him the best wishes of not only the Link-Belt Company but those of his many business associates and friends.

The Cleveland office of the Link-Belt Company has changed from Room 429 to Number 329, and the building in which they have so long found quarters has again changed hands and names. In the future the address of the Link-Belt Cleveland office will be No. 329 Rockefeller Building.

Notice has recently been received of the removal of the Link-Belt Company's Pittsburgh branch office from its old quarters at 1501 Park Building to new and more commodious offices at 335 Fifth Avenue. T. F. Webster, manager of the Pittsburgh office, says that larger space and the more convenient location was imperative because of the extraordinary volume of business transacted during the past year and which promises to remain in full swing at least for the coming fiscal year.

New Cement Film

Much of the unusual equipment involved in making cement is interestingly illustrated in a two reel moving picture called "The Story of the Manufacture of Portland Cement," just released for general showing.

Starting with views of one of the large plants in which the country's cement is made, the film pictures in a non-technical way the essential steps in transforming thousands of tons of raw materials into Portland cement. Scenes taken at a number of plants are included.

From the moment that a great blast breaks loose a cliff of limestone in the quarry to the time when the finished cement goes into storage in big concrete bins, the process of manufacture is almost entirely mechanical—otherwise present day outputs would be impossible.

In addition to straight photography, animated drawings have been inserted to make clear what occurs inside the grinding mills, what goes on within the white-hot interior of the huge kilns, and how the cement sacks, suspended upside down, are filled after they have been tied.

This film can now be secured without charge by interested organizations through any office of the Portland Cement Association, or from Association headquarters at 111 W. Washington St., Chicago.

Quarry, Sand and Gravel Items

The Superior Cast Stone Co., Grand Rapids, Mich., has been incorporated for $10,000.

The Los Angeles Decomposed Granite Co., Los Angeles, Calif., has been recently incorporated with a capital of $60,000 by E. J. Skeans, S. E. McCallum and M. H. Pearson.

The Kansas Sand Co., Topeka, Kansas, has just been organized and will be incorporated for $50,000. Otto Kuehne, Jr., is the president. Plant will be located in the Kaw river.

The River Products Co., J. L. Records, Prest., L. C. W. Clearman, Secy., S. Hands, Mgr., Iowa City, Iowa, has been recently incorporated with a capital of $350,000 to operate limestone quarries.

The Tolu Fluorspar Co., Evansville, Ind., has been recently incorporated for $50,000 by J. D. Folz, Tolu, Ky., James F. Ensle and C. H. Parsons, Evansville, Ind., to operate fluorspar mines in western Kentucky and southern Illinois.

The American Cement Plaster Co. of Wisconsin, Milwaukee, Wis., has been recently incorporated with a capital of $25,000 by L. E. Stanton and others.

The Santiago Creek Rock and Gravel Co., Olive, Calif., has been recently incorporated for $50,000 by L. F. Baash, H. M. Dailey of Whittier, and J. Renfroe of Brea, Calif.

The Clarke Rock & Gravel Co., Los Angeles, Calif., has been recently incorporated with a capital of $100,000.

The Funk-Rasmussen Co., La Crosse, Wis., has been incorporated for $150,000 by E. A. Funk, A. J. Rasmussen and W. F. Funk to own and operate quarries.

The Glacier Sand & Gravel Co., Mitchell, S. Dak., has been incorporated with a capital of $50,000 by W. C. Roberts, H. W. Hotchkiss and R. E. Heald.

The J. Eula Gravel Co., V. S. Watson, Prest., is erecting a gravel washing and screening plant at Delight, Ark.

Bodega Materials Co., Murphysboro, Ill., operates a crushed limestone plant with a daily capacity of 20 cars. Operates two No. 5 and No. 3 Allis Chalmers crushers. It intends to increase its capacity within the next six months by installing more crushers. Writes us as follows: "We will probably install steam shovel. Want prices and catalogs on dump cars, crushers, steam shovel and blast hole drills."

The Kirkpatrick Sand & Cement Co., Birmingham, Ala., will erect a warehouse to cost $50,000.

The Cherokee Marble Mills, Knoxville, Tenn., contemplate constructing a $20,000 marble plant at Knoxville.

The Woodbridge Trap Rock Co., Woodbridge, Conn., has been purchased by the Bertolino Bros. Co., which operates a small quarry adjoining it. The two plants will be combined.

The Blair Limestone Co., Millville, Maryland, announces it will enlarge its plant, also increase wages between eight and nineteen per cent.

The Sparta Quarry and Limestone Association has been formed by Sparta, Ill., interests to produce limestone rock and agricultural limestone.

The Hunter Valley Stone Co., Bloomington, Ind., has increased its capital from $60,000 to $150,000.

The Zenith Sand & Gravel Co., Carlton, Minn., is erecting a $150,000 plant at Moose Lake, with a capacity of 2500 yards of washed material daily. The plant will be known as the Moose Lake Sand & Gravel Co. and will be ready for operation shortly.

The Midwest Crushed Stone Co., Greencastle, Ind., will purchase land for quarrying valued at $50,000, says President L. R. Cartwright. It has decided to spend about $40,000 on expansion of the plant.

The Superior Lime & Hydrate Co., Pelham, Ala., has been incorporated with a capital of $100,000 and will begin constructing a plant with 15,000 bbl. capacity per month, to cost $70,000 with machinery. H. G. Bridgewater and W. D. Lewis, Jr., of Birmingham are the incorporators.

The New London Sand & Gravel Co., Willmar, Minn., has been recently incorporated with a capital of $80,000 by H. L. Wadell and others.

The George E. Bond Granite Co., Inc., Barre, Vermont, has been recently incorporated for $25,000 by L. Pilini, G. Pilini and E. Pilini.

The River Road Sand & Gravel Co., Inc., Camden, Mass., has been recently incorporated with a capital of $125,000.

The Willmette Gravel Co., Portland, Oregon, has been incorporated for $25,000 by E. Wood, G. F. Krause and M. M. Mathiesen.

The Sound Sand & Gravel Co., Seattle, Wash., has been incorporated with a capital of $50,000 by W. R. Chesley, A. S. Kerry and J. W. Kerry.

The North Trunk Sand & Gravel Co., Fairmont, W. Va., has been recently incorporated with a capital of $10,000 by J. C. Knight, J. R. Binyon, and P. M. Binyon.

The Fairmont Sand & Gravel Co., Fairmont, W. Va., has been recently incorporated with a capital of $50,000 by D. D. Simon, M. Simon, S. C. Board, D. W. Carpenter and S. B. Miller.

The Suiter Material and Transport Co., Manchester, Ohio, has been recently incorporated for $50,000 and is operating plants at Manchester, and elevators at Irwin, Ky.

The Foundry Sand & Supply Co., Cleveland, Ohio, has been recently incorporated with a capital of $25,000 by H. B. McGraw, H. J. Piehl, A. D. Bender, T. H. Bushnell and B. K. Piehl.

The Brocklebank Co., Inc., Chelsea, Vermont, has been recently incorporated for $50,000 by H. N. Mattison, M. A. Little, S. H. Silson, of Chelsea, and H. Lyman of Trunbridge, Vermont.

The Knoxville P. & M. Mortar Co., Knoxville, Tenn., has been recently incorporated for $750,000 to manufacture mortar lime, cement, plaster, stucco, fireclay, etc. W. B. Townsend is president.

The Lime By-Products Corp., Charleston, W. Va., has been recently incorporated for $500,000 to manufacture lime and cement by J. S. Horan, M. F. Matheny, G. L. Hartley and H. Greene.

The Springfield-Pekin Sand & Gravel Co., Pekin, Ill., is contemplating the expenditure of $150,000 on a new gravel pit.

The Pratt Rock & Gravel Co., 518 Hearst Bldg., San Francisco, Calif., plans to develop a rock quarry with 1,000 tons daily capacity, to be built in a few months at Folsom, Calif. Wants prices and catalogs on locomotive cranes, jaw crushers, revolving screens, quarry cars, gasoline locomotives, elevator buckets, motors, belt conveyors, rubber belting, and steam shovel.

Fred Burun, of Algoma, Wis., has plans under way for the construction of a limestone crushing plant at this city. Limestone rock will be taken from the shores of Lake Michigan.

The Wilkinson Sand Corp., C. W. Wilkinson, Prest., Moloney Bldg., Wedron, Ill., is spending $25,000 on new machinery and equipment, including a steam shovel and steam locomotive. The shovel will have a capacity of thirty-five cars of sand a day.

The East End Sand & Gravel Co., East Main St., Chillicothe, Ohio, operates a pit with a daily capacity of 400 tons. Operate Sauerman dragline, ¾ yd. and a Telsmith screen, Thomas steam hoist. Wants prices and catalogs on wire rope, automatic grizzly feeder and screens, elevator buckets and wagon loaders.

N. V. McAnge Lime Corp., Suffolk, Va., operates 8 brick built kilns. Writes us as follows: "We contemplate putting pulverizer in to crush oyster shells. We want prices and catalogs on crushers, crushing rolls, pulverizers, wire rope aerial carrier sprocket wheels, pulsating screens, belt conveyors, wagon loaders, and elevating or conveying chain."

The Spencer Quarries Company, Spencer, S. Dak., operates a quarry with a daily capacity of 500 tons. It operates two crushers, one Gates and one Allis Chalmers. Also operates Armstrong hand drills.

The Prairie Sand & Gravel Company, Prairie du Chien, Wis., has recently been purchased by C. J. Knight and R. W. Whale of Waupaca, Wis. The company writes us that it operates a LeClair ¾ yd. scraper and 8-in. centrifugal pump. Wants prices and catalogs on lock seam spiral pipe.

The Industrial Sand & Gravel Corporation, Lawton, Okla., has been recently incorporated with a capital of $60,000 by J. W. Eastman, Andrew Crosby and others. They write us as follows: "We expect to install a plant of twenty-five cars per day capacity. We will install at once complete equipment such as sand pump, dragline, washing equipment, screens, suction dredge, barges, suction hose and lock seam spiral pipe.

The Buchanan County Quarries Company, St. Joseph, Mo., has been recently incorporated with a capital of $10,000 by J. L. Choune, E. G. Vitek, and H. A. Reece.

The Beverly Sand & Stone Company, Liberty, S. C., wants prices and catalogs on 24- and 30-inch conveyor carrier, 30- or 36-inch gyratory crusher, 48-in. or larger revolving screen and a small revolving steam shovel.

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The World's Record Road Program

Summary of Figures From the Various States and Cities Reaching an Amazing Total —Thirty-Eight States Report Aggregate of $259,403,000—Cities Add to Big Figures

How much is a million? No individual can, in his own personal consciousness, conceive the vastness of that sum. When applied to a sum of money, it represents what, a generation ago, seemed the vastest amount that could be mentioned in a breath. Yet, in this current year of 1923, a million dollars is less than one-fifth of one per cent of the amount of money that is being spent in the United States for roads. To plagiarize from the soap-box orator, from the rock-ribbed coasts of Maine to the sunny slope of California and from the indigo lakes to the azure gulf, millions are being poured out to smooth the way for the nation's traffic. The total will most certainly exceed $500,000,000.

Translated into terms we can understand, this sum would buy the labor of a million men at five dollars a day for a hundred days; it would purchase at $3 a barrel, over 166,000,000 barrels of cement; it would build, at current prices and wages, practically all the buildings that are being erected in the United States today. Specifically, at $2.50 per square yard, which is the average price for road work, it would improve 200,000,000 square yards of highway, or, at $20,000 per mile, would build 25,000 miles of concrete road. That means 500 miles for every state in the Union, and it means 500 miles completed every week in the year.

The great Roman highways in Great Britain, which earned for Caesar and his contemporaries twenty centuries of unending praise and admiration, were, in the total, less than is being done in this nation in every week of the current year. The labor that built the great Chinese Wall in a century of time is being compressed into every fortnight, and this is but one of the many activities of American enterprise today.

Government figures show construction to be the nation's greatest business save only one—agriculture. And of this second greatest business, road-building is the most important factor. Where other phases of construction total in the tens of millions, roads run into hundreds, and are surely and swiftly reaching for the billion mark.

Realizing the importance of industry in general and to the cement business in particular, CEMENT AND ENGINEERING NEWS has compiled a summary of the highway work now under way by the various state governments. The figures are as accurate as can be obtained. For them and for their accuracy we are indebted to the highway departments of the several states. The only regret is that the officials of ten states, by a failure to furnish information, have rendered the compilation less complete and therefore less valuable than it would otherwise be.

The thirty-eight states which reported show a total of work now under contract of $259,403,000. It should be remembered that this represents solely work under the jurisdiction of the state governments, and is wholly aside from any city, county, township or improvement board work. Neither does it in any way represent the total of work projected, as many states have on their calendars several times the work here considered. All projects included here either are now or will be under contract before the first of August.

The honor-roll of the Republic, state by state, with the amount of work in each which has reached a point where it is actually now under contract, is as follows:

San Francisco believes in concrete. A portion of the sea wall in which cement has been extensively used.

ALABAMA: Seventy-five miles of macadam, thirty miles of asphalt and concrete and four miles of concrete are either carried over from 1922 or under new contracts, at a total expenditure estimated at $5,000,000. Together with bridge and grading work, that state has under appropriation a total of..... $ 8,584,000

ARIZONA: This vast but sparsely populated state has under way, in grading, paving and bridge work..... 1,270,000

ARKANSAS: New contracts for $450,000, plus hold-over work from last year, has under way a total of..... 625,000

CALIFORNIA: Appropriations have not been made, hence the future is uncertain. Forty-nine miles of work is carried over from last year, the cost of which will be $1,056,482, with $286,446 in bridge work to go ahead, California's certain total is 1,343,000

COLORADO: Carried over $2,112,000 in unfinished contracts; has let new ones for $5,272,700, which, together with bridge work under way to the extent of $960,000, totals for the Centennial state 8,345,000

DELAWARE: Cleaned up last year, carrying over only two miles on uncompleted contracts. Eighty miles of new contracts at an average of $30,000 per mile, plus $200,000 in bridges, puts the smallest state far from the bottom with..... 2,600,000

IDAHO: But little paving is being done, only seven miles of concrete highway going in this year; however, $2,000,000 worth of grading and graveling is being done, and $175,000 worth of bridges; total..... 2,175,000

ILLINOIS: Illinois is one of the big ones, as she is still working on a $60,000,000 bond issue. A total of 748 miles of road is left over from last year's contracts and 152 miles more have been put under contract this spring. Efforts are being made to complete the entire 900 miles, all of concrete road, at a total expenditure of $23,400,000. This vast expenditure includes a total of 9,504,000 square yards of pavement and eighty-six bridge structures of varying sizes. The legislature has recently made possible a fresh bond issue of more than $100,000,000, which will be subject to a popular referendum. Work under way this year totals the above mentioned figure of 23,400,000

IOWA: The great corn state, while doing only sixty-one miles of concrete roadway on hold-overs and thirty-five miles on new contracts, or ninety-six miles in all, at a cost of $2,700,000, is facing an enormous program of grading and gravel surfacing. Held over from last year is 505 miles of grading and 180 miles of graveling, while new contracts have been let for 765 miles of grading and 300 miles of graveling. Also bridge work to the extent of $1,500,000 is under way. Total of Iowa expenditures this season is..... 9,000,000

KENTUCKY: The land of the blue-grass is contemplating no great expenditure this year. Twelve and one-half miles of paving is held over from last year and twenty miles of new work is under way, which together with some bridge work, will amount to about..... 1,000,000

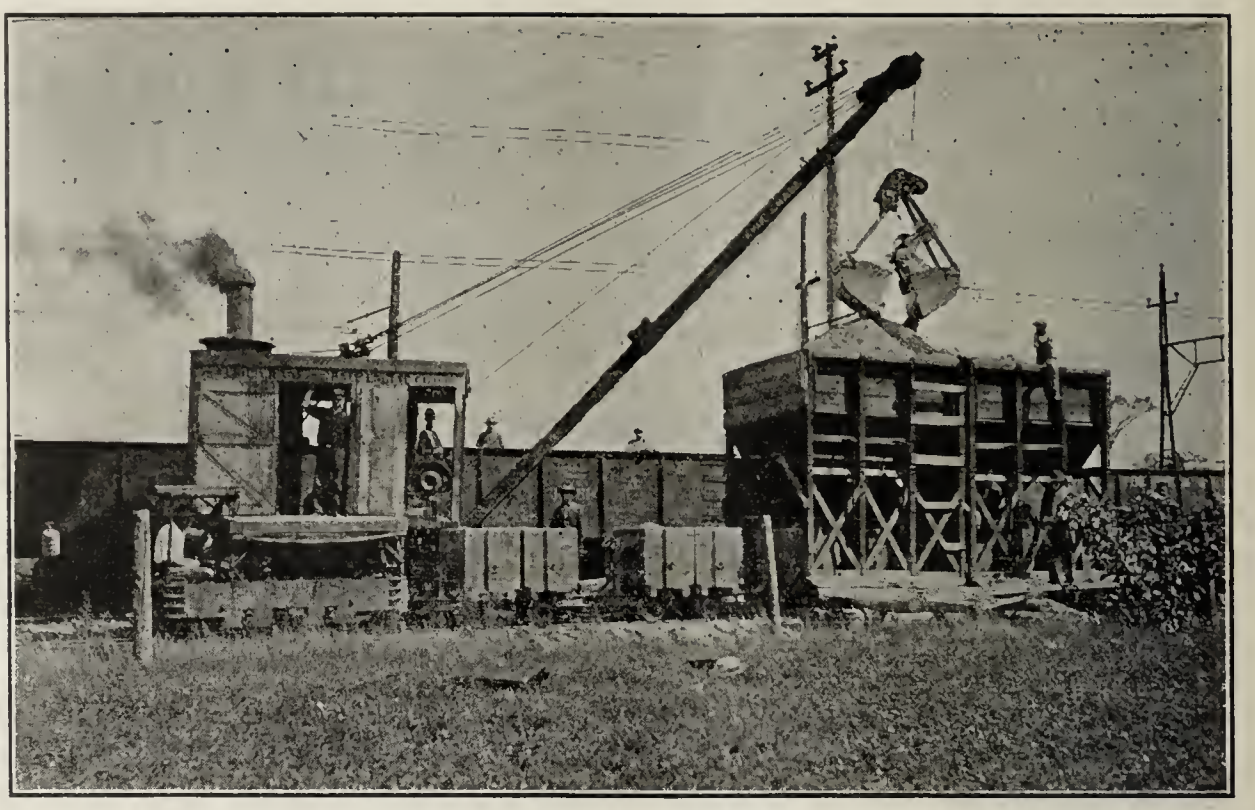
LOUISIANA: So far this state has entered on no campaign of real hard road building. Each year some 500 miles of roadways are graded and surfaced with either gravel or macadam and 1923 will be no exception. Such work will total around..... 2,000,000

MAINE: Maine is attempting a 2,700,000 square yard program, but fears that a shortage of labor will seriously curtail accomplishments. Two million square yards have recently been put under contract and 1,000,000 were carried over from last year. Coupled with bridges under contract at a cost of around $1,000,000 the 1923 expenditure will approximate 8,500,000

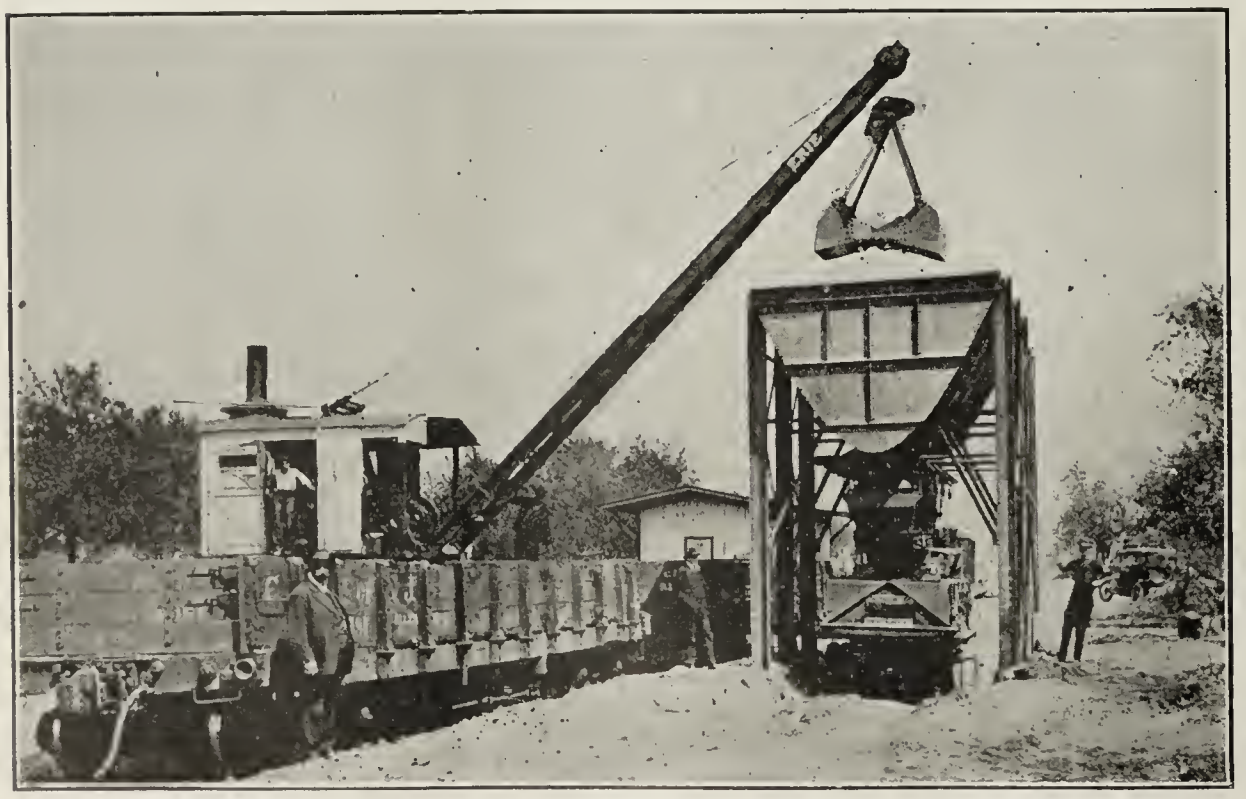
MARYLAND: Some 300 miles of roadway is under contract, half of it being carried over from 1922 and half being new work. Of this only about 200 miles is expected to be done this year, of which about two-thirds is concrete standard highway construction. Including $265,000 in bridges, Maryland's total expenditure this year will aggregate 4,265,000

MASSACHUSETTS: The old Bay state is conservative in road building as in everything else, but in her small area has under way 359,120 square yards of eight-inch concrete roadway, which will involve the expenditure of $1,208,000. Added to this is $150,000 for bridge construction, making a total for this commonwealth of..... 1,358,000

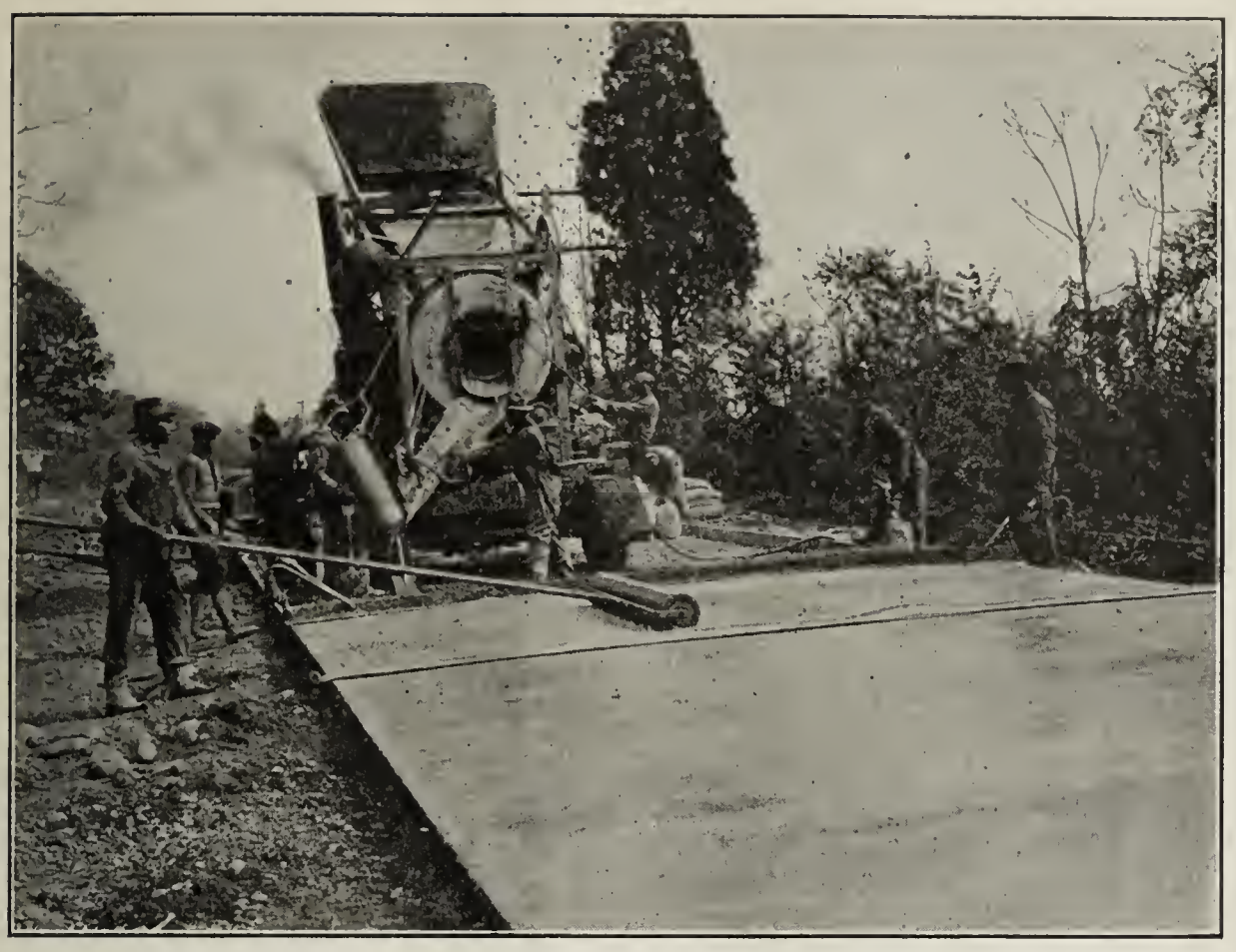
MICHIGAN: Here a heavy bond issue is beng used. About 149 miles of pavement is left over from last year and 318 miles of new work has been placed under contract. It is being attempted to complete this entire enormous work program this year. It includes a total of 4,931,000 square yards of concrete



A crane of this type eliminates all wheeling on a road job.



The modern equipment of a New Brunswick, N. J., contractor.



At work on the Columbia Pike experimental road, Arlington County, Va.

highway construction and $2,000,000 worth of bridge building, which brings the total up to the impressive figure of..... 13,836,000

MINNESOTA: State funds available for road building have become exhausted and only 15,000 square yards of new work is to be undertaken this year. In addition to this, St. Louis county has fifty miles of hold-over work under way. Total money is road work this year will approximate 1,200,000

MISSISSIPPI: The Dixie states are well in the band-wagon when highway construction is considered. In this one, sixty-five miles of road is under contract this year, of which only 26 miles is expected to be finished in 1923. Total of highway work under contract is..... 6,000,000

MISSOURI: The men in Missouri have been shown, and, having been shown, are showing the rest of the country. On old contracts, there remain to be completed 1,360 miles at a contract figure of $22,445,000. Since January 1, 227 additional miles have been placed under contract for $6,135,000, and contracts will soon be let for another $6,532,000 worth. Steel and concrete bridge structures are under way to the extent of $3,200,000. In all, including grading, graveling, macadamizing, and paving with asphaltic concrete, cement concrete and vitrified brick, this great commonwealth has under way in 1923 a total of..... 29,233,000

NEBRASKA: No work was carried over from last year and no bridges are being built. Thirty-two and one-half miles of road has been placed under contract this year, involving 350,000 square yards of surface at a total expenditure of..... 1,218,000

NEVADA: Contemplates construction this year of ten and two-thirds miles of highway at a cost of..... 300,000

NEW HAMPSHIRE: Has but little under way. One mile of concrete road is being built and 29,780 square yards of other road work is being done; also twenty bridges averaging twenty feet in length are being built. Total expenditure will approximate..... 100,000

NEW JERSEY: From last year thirty miles of work is carried over and seventy-five miles of new contracts have been let. It is hoped to complete this entire 105 miles of work at a cost of $7,000,000, and to this must be added bridges worth $1,500,000, making a total of..... 8,500,000

NEW MEXICO: With but light travel over large areas, New Mexico finds it necessary to undertake, this year, the construction of 96,000 square yards of road building and bridge structures, involving 15,000 cubic yards of cement work. The total expenditure will approximate..... 300,000

NORTH CAROLINA: Working under a $50,000,000 appropriation, this state now has under contract and in course construction, 1,823 miles of various kinds of road work at a total contract figure of $34,505,000. It has recently placed an additional 137¾ miles under contract at a cost of $2,992,000. It is interesting to note that less than $1,000,000 of all this work is benefiting from federal aid. The grand total of work under way in this state, which includes $1,395,000 in bridges, calls for the expenditure this year of..... 37,497,000

NORTH DAKOTA: But little concrete work is being done as yet, most of the work in this state being confined to grading and graveling. This is now under way, 500 miles of grading, 200 miles of graveling and one mile of concrete roadway, at a total cost, including bridges, of.... 1,800,000

OHIO: Ohio is spending money for roads. Last year saw unfinished contracts carried over to the extent of 550 miles, involving $16,782,000. This year new contracts have been let covering 500 additional miles at a cost of $13,318,000. It is hoped to complete the entire 1,050 miles, which includes 10,500,000 square yards of paving and $1,000,000 in bridge construction, this year. Ohio's total is..... 30,000,000

OKLAHOMA: Oklahoma carried over thirty miles of work and has recently contracted eighty-eight miles more. It expects to complete eighty miles this year and will spend, including for bridges..... 600,000

OREGON: In the mountain states bridges cost more than roadways. Here 222,000 square yards of highway is under contract, nearly ninety per cent of it being carried over from last year, at a cost of $535,000. The addition of $800,000 in bridges brings the total up to..... 1,335,000

PENNSYLVANIA: The Keystone state carried over from last year 187½ miles of work and has placed under contract this year 250 miles more, ninety-five per cent of which is to be of reinforced concrete construction. This work amounts to the im-

Working on concrete road at Arpin, Wis. The Four Wheel Drive Truck is arranged in three body compartments, dumping its contents into the mixer.

A modern paving unit using auto trucks for hauling aggregate.

pressive total of 2,797,000 square yards and will total, in money.... 12,259,000

RHODE ISLAND: Having carried over 19,100 square yards of road work, 183,452 square yards more was placed under contract this spring, of which total only some 100,000 square yards is expected to be finished this year. Total amount now under contract, including $200,000 for bridges, is..... 887,000

SOUTH CAROLINA: This state has a pretentious program. The total mileage of roads in the state system carried over from last year is 266 miles, of which forty-one miles is to be hard surfaced at a contract cost of around $2,500,000. Added to this is 350 miles of new contracts, including twenty-five miles of hard surface at a cost of $3,500,000 more. Four large, three medium and fifty-four small bridges are included, the total cost of the work now under contract being.... 6,023,000

SOUTH DAKOTA: No paving is being done here, but general road work is under way to the extent of..... 350,000

UTAH: Eleven and one-half miles of work was carried over last year and 135 miles of new contracts have been let, including 5,000 cubic yards of bridge construction. Total surfacing involved 264,000 square yards at a cost of around..... 1,000,000

VERMONT: Having carried no work over, Vermont has this year contracted for 125,000 square yards of road work and for $200,000 for bridge construction. Total figure is estimated to be around 600,000

WASHINGTON: Nine miles were carried over and fifty-one miles more have been placed under new contract, involving a total of 720,000 square yards of road work and $1,000,000 worth of bridge building. Expenditure this year will total around..... 3,000,000

WEST VIRGINIA: From last year's ambitious program, approximately $7,000,000 worth of work was carried over into this year. So far this year new work to the extent of $975,000 has been contracted. More contracts are to be let and the year's total will reach..... 15,000,000

WISCONSIN: A total of 400 miles of highway construction is scheduled for 1923, 107 miles having been carried over from last year. While no estimate of a total is officially given out, it will approximate..... 9,000,000

WYOMING: Old work to the value of $2,100,000 is under way and new contracts totaling $2,200,000 have been let. Coupled with $600,000 of bridge construction, the year's total will sum to..... 4,900,000

In the foregoing summary several states are omitted, for a variety of reasons. For example, Texas, knowing no off-season, has no estimates by seasons, and therefore offers no figures. Several states made no returns on inquiry, the missing states being Connecticut, Florida, Georgia, Indiana, Kansas, Montana, New York, Tennessee, Texas and Virginia—a total of ten states, or practically one-fifth of the United States. Should the average in the missing states run in proportion to that in those which are here reported, the amount of road work under way under the jurisdiction of the forty-eight states will approximate $68,000,000 more than the figure given in the leading paragraph of this article, or, for the nation, over $325,000,000, which means over $1,000,000 for every working day in the year.

What proportion of all the work under way is included in the foregoing is purely conjectural. Municipalities by the score are doing work which runs into millions. With no attempt being made to arrive at a definite figure for all the cities of the country, a review of several, large and small, east and west, is illuminating. Taken at random, several representative cities report as follows:

CHICAGO: Has carried over 440,550 square yards of paving and is contracting 1,300,000 square yards of new work. The total expenditure by the city, exclusive of work done by the three park systems, is.....$ 6,500,000

CLEVELAND: About $50,000 worth of work was carried over and new contract let for $3,500,000; total..... 3,550,000

DAYTON: Including 10,000 square yards of paving carried over from last year, will do a total of..... 750,000

DETROIT: This city of surprising growth contemplates for this year the completion of 80,000 square yards of street paving and 270,000 square yards of alley paving, at a total cost of.... 5,610,000

MILWAUKEE: Reports no work carried over, but new work to be done at a cost of..... 550,000

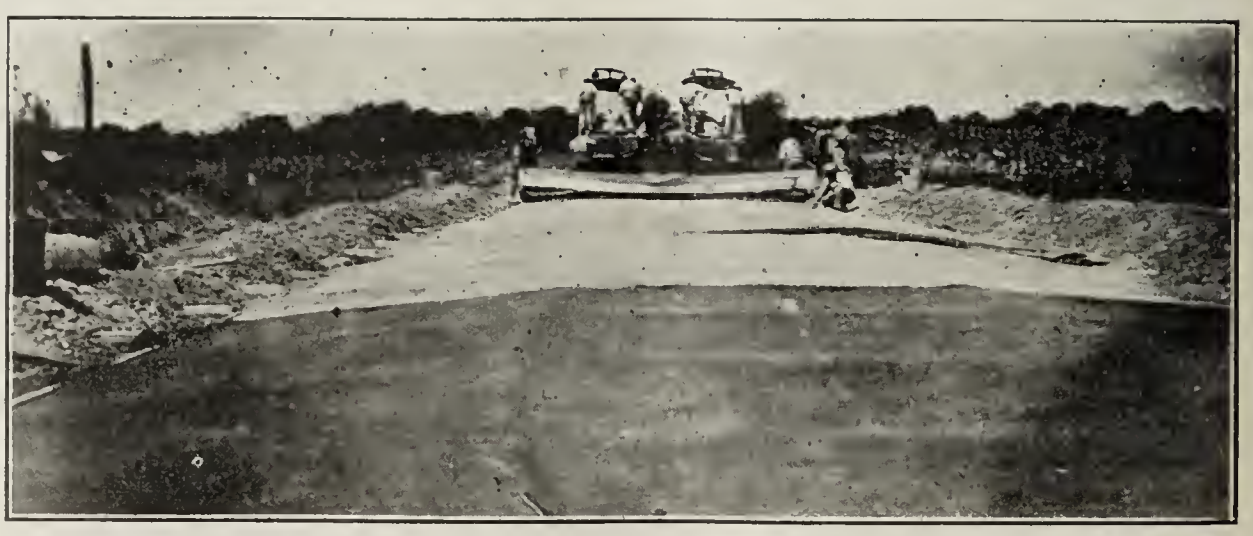
NEW YORK CITY: One borough alone reported—Manhattan—and it is contracting for work to the extent of..... 1,324,000

PHILADELPHIA: Forty-two miles of streets are to receive attention, which including $1,285,000 for bridges, will mean an expenditure in the Quaker City of 4,035,000

SAN FRANCISCO: In various paving projects will spend a total of..... 1,232,000

TERRE HAUTE: Having carried over from last year paving to the extent of 5,400 square yards, it has now contracted an additional 25,000 square yards at a total cost for this summer's projected work of..... 85,000

These few cities are shown to be projecting a total of $23,636,000 of paving work in 1923. If the roll of cities were to be called from Augusta, Me., down through Boston, Newport, the other boroughs of New York, Albany, on through the east at Rochester, Buffalo, Washington and Baltimore; in the south through Atlanta, Tampa, Savannah and Mobile; in the great middle west in Cincinnati, St. Louis, Kansas City and up in Duluth and the Twin Cities; then out through the great west to Denver, Salt Lake, Los Angeles and Seattle, who can venture what the total would be? Surely the examples we have named are but a tenth of the whole. If this is true, at one great slash $225,000,000 more of paving work is to be added to the aggregate.



Wet mix handled by auto trucks and dumped into position on concrete road.

Three bridges which beautify the national system of roads. At the left, a bridge in Oregon. In the center, the Chelan arch in Washington. At the right, a bridge near Sutton, New Hampshire.

More than Half a Billion for Good Roads

Road Construction Proceeding Rapidly with States Completing Programs as Indicated by Government Reports

WASHINGTON, June 20—About half a billion dollars represents the combined total of federal and state appropriations for road construction during the present year. Prospects are that there will be a little more road construction this year than last, although last year was regarded as highly satisfactory.

Reports received by the Bureau of Public Roads of the Department of Agriculture do not indicate that there has been any marked curtailment of road construction activities in line with President Harding's advice to relieve present conditions affecting materials and labor by postponing public works so far as possible until a period when business slackens up. Any curtailment along this line would be a matter for action by the states. The federal government having made available appropriations for the use of the states under the federal aid system leaves it to the judgment of the states as to when to proceed with the work.

Wages being paid in road construction are generally slightly higher than a year ago, with the exception of the Pacific Coast where the same rate prevails. The greatest increase in wages has taken place in New England where the present level is approximately thirty per cent higher than a year ago.

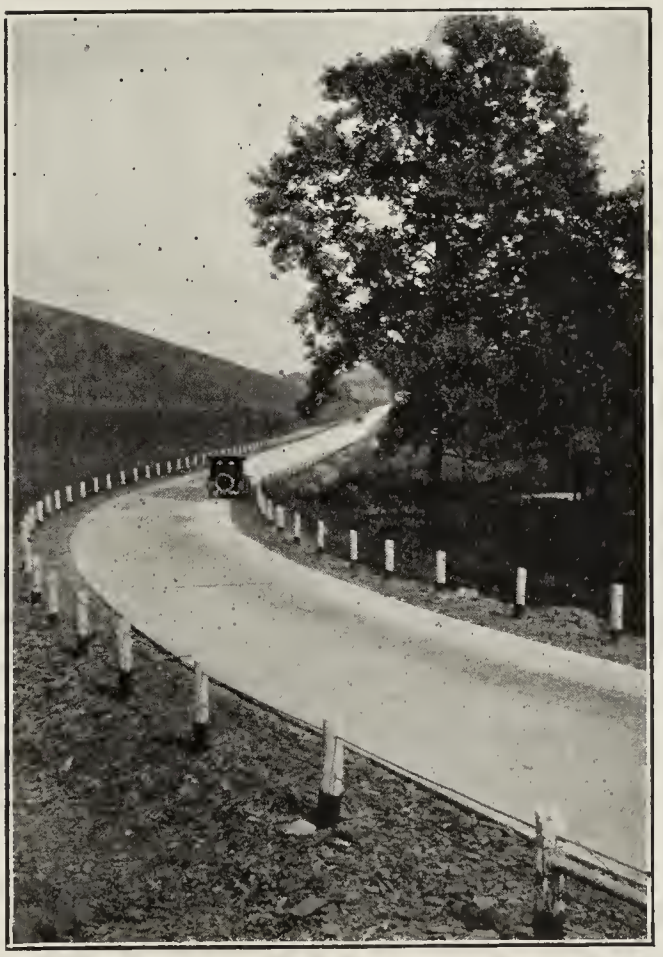
Various factors lead officials of the Bureau of Public Roads to regard the general outlook as considerably better than one year ago when the railroad and coal strike loomed as disturbing elements. The designation of the system of federal aid highways in most of the others. With a definite program for accomplishment laid out road work can proceed much more smoothly.

What States Are Doing

Returns for thirty-three scattered states show that in these states there will be available $507,014,205 for road work as compared with $456,513,339 spent in the same states last year, the figures including both federal and state appropriations. On federal aid work there was under construction on April 31, 14,000 miles of road estimated to cost $261,000,000 as compared with approximately the same mileage estimated to cost $233,000,000 twelve months previous. In addition to this funds have been alloted to specific federal aid projects which will involve a total of something like $130,000,000 and many of which will soon be under construction. On the above date there was still available to be alloted to specific projects $90,000,000 which if matched by the states in the same proportion as in the past will involve a total of something like $210,000,000,.

From latest reports it appears that thirty states now tax gasoline as compared with four states at the beginning of 1921. Most of the revenue derived goes for road purposes and bureau officials regard this as a step in the right direction. With road users paying a more equitable share of the cost, highway finance is placed upon a firmer foundation.

Figures compiled by the Bureau of Public Roads indicate that out of 25,000 miles of federal aid roads which have been completed 18.3 per cent are of the cement-concrete type. Gravel roads comprise 39.1 per cent of the total while graded and drained roads represent 20.6 per cent. Other types of roads include sand-clay, 10.8 per cent, bituminous macadam, 4 per



An attractive stretch of road in Pennsylvania. Note the concrete posts at the sides.

cent, bituminous concrete, 3.1 per cent, waterbound macadam, 2.7 per cent, and brick, 1.4 per cent.

Inasmuch as the federal aid roads include roads built in all sections of the country and figures are regarded as fairly representative of the character of the main highways. Complete figures covering all roads constructed and now in use probably will show a somewhat higher percentage of the lower types of road since the more important roads have been selected for improvement with federal aid.

Scientific Road Building

Secretary of Agriculture Wallace regards the administration of the federal road act as one of the important phases of the work of his department. In a recent discussion of the road construction problem Secretary Wallace emphasized the fact that successful and economical road building is becoming more and more dependent upon careful scientific research.

"Naturally those who are concerned in the development and use of automobiles will be most keenly interested in that part of the work of the Department of Agriculture which has to do with roads," said Secretary Wallace. "Our relation to road building lies in the two fields of scientific research and the administration of the federal road act. The increasing use of rapidly moving motor vehicles brings many new problems of road construction. The vast sums of money which are being spent make it necessary that we attack these problems vigorously if we would avoid enormous waste. Successful and economical road building more and more is becoming dependent upon careful scientific research.

"Roads must be adapted to the density and character of the traffic. In rural sections where the roads are used mainly for moving farm products to market and for tourist travel, the building of a road that will stand up is a very different matter than in regions where there is a heavy traffic of freight-carrying trucks. Conditions of soil and climate, of rainfall, drainage temperature, all must be studied. The sort of road-making material available and its suitability to the character of the road needed must be ascertained. How best to use this material is a matter for scientific determination. The funds available for road improvement without imposing unduly heavy tax burdens must be considered. Surfacing material must be determined with relation to the traffic.

"The department of Agriculture is making careful study of all such matters, as well as a number of others concerning which information is needed if we would build our roads wisely. We are conducting inquiries into the traffic-carrying capacity of the sand-clay and top soil roads in the Southern states. Field parties are studying gravel roads in the Northern states and trying to ascertain why in some sections waves form more rapidly than in others and what can be done to prevent them. We are developing and standardizing tests for sub-grade materials and their treatment. We are inquiring into methods of drainage and developing most interest-

ing information. Our engineers are investigating the matter of pavement designs and are conducting careful impact tests to secure information on the load-carrying capacity of roal slabs of different designs and the behavior of surfacing materials under varying conditions of traffic.

"The character and density of road traffic has been changing so rapidly that no one can speak with full authority as to the best methods and types of road construction. The whole question is one for persistent and continued scientific study, and it is the expectation of the department to extend this study just as rapidly as its funds permit and the results seem to justify.

"The designation and approval of the federal aid highway system under the act of 1921 is progressing rapidly. By the end of the summer approximately 179,000 miles will have been designated as a part of this system. Up to May 5 all but three states had submitted tentative systems for approval. The systems of thirty-three states had been formally approved, including a total of 105,406 miles.

"Considering the approved systems in the thirty-three states we find that of the 1,015 cities of 5,000 or more population in these states 959 of them lie directly on the approved system, and there is not one but will be connected with the system by an improved state or county road. When the system is completed, therefore, one will be able to travel from any town of 5,000 population or greater to any other town of the same population without leaving an improved road.

"The detailed study of the availability of the improved roads to the total population has not been completed, but if we take typical states in the East, Middle West and West, we find that the roads on the federal aid system will give a maximum of service. In Maryland not more than two and one-half per cent of the population lives further than ten miles from a federal aid road; in Indiana less than one per cent; in Arizona, where the total population is but 334,000, perhaps one-third will live outside of the ten mile zone.

"A federal aid road will cross the western mountains at practically every one of the important passes. The Rockies will be crossed at Berthoud, Lookout, Gibsono Targhee, Pleasant Valley and Reynolds passes in Montana and Idaho; La Veta, Wolf Creek and Red Mountain passes in Colorado, and Raton pass on the Colorado-New Mexico line. The Cascade range will be crossed at Stephens and Snoqualmie passes in Washington, and

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

STATUS OF FEDERAL AID HIGHWAY CONSTRUCTION

AS OF APRIL 30, 1923

B.P.R.F.A.A.—1.

M.—April, 1923—C-2.

STATES	FEDERAL FUNDS							Total Cost and Mileage of Projects Completed From July 11, 1916 To April 30, 1923		STATES
	*Apportionment Balance March 1, 1923	Allotted or Paid for Specific Projects: Allotted to Projects Not Yet Under Construction	Projects Under Construction: To Be Paid As Construction is Completed	Projects Under Construction: Paid for Completed Work	Paid On Projects Completed Since July 1, 1922	*Total Allotted or Paid (Sum of Columns 2 3, 4 and 5)	Balance for New Work (Deduct Column 6 from Column 1	Final Cost	Mileage	
	1	2	3	4	5	6	7	8	9	
Alabama	$ 8,239,872.49	$ 1,788,711.97	$ 2,925,166.84	$ 1,522,426.37	$ 290,313.94	$ 6,526,619.12	$ 1,713,253.37	$ 3,706,547.04	357.9	Alabama
Arizona	4,708,908.38	855,728.10	622,041.50	802,196.80	1,333,432.76	3,613,399.16	1,095,509.22	6,292,029.42	329.2	Arizona
Arkansas	6,088,639.93	388,454.78	1,187,035.32	1,201,209.98	1,503,211.48	4,279,911.56	1,808,728.37	8,429,840.35	719.8	Arkansas
California	13,204,377.76	656,978.62	3,043,892.74	3,122,114.90	2,076,253.52	8,899,239.78	ac 4,305,137.98	8,363,421.56	328.8	California
Colorado	6,567,053.25	824,299.45	1,128,092.12	1,105,490.25	1,086,021.37	4,143,903.19	2,423,150.06	5,623,359.23	342.8	Colorado
Connecticut	2,741,770.31	392,104.56	416,463.51	65,567.99	862,238.07	1,736,374.13	a 1,005,396.18	2,568,643.95	60.7	Connecticut
Delaware	980,250.00	360,750.00	30,890.77	161,234.23	227,500.00	780,375.00	199,875.00	2,196,610.22	45.3	Delaware
Florida	5,369,849.85	1,586,663.77	1,424,256.35	1,787,989.14	.....	4,798,909.26	570,940.59	69,466.31	15.6	Florida
Georgia	6,830,595.31	1,031,737.70	1,980,172.70	1,675,134.35	559,911.19	5,246,955.94	1,583,639.37	13,622,343.58	882.0	Georgia
Idaho	2,712,614.11	144,705.08	347,876.48	421,292.80	243,711.13	1,157,585.49	a 1,555,028.62	6,880,673.73	426.1	Idaho
Illinois	9,563,721.21	4,558,476.28	1,724,332.61	323,793.57	682,759.28	7,289,361.74	2,274,359.47	25,083,411.17	739.9	Illinois
Indiana	10,695,593.78	3,459,397.09	1,791,998.39	1,075,445.22	874,171.61	7,201,012.31	3,494,581.47	5,273,363.59	150.0	Indiana
Iowa	9,746,010.05	1,162,004.00	2,256,774.70	2,198,060.19	2,532,257.86	8,149,096.75	1,596,913.30	15,989,127.36	1,047.3	Iowa
Kansas	11,325,778.09	824,674.53	3,205,131.37	2,649,127.46	2,356,157.47	9,035,090.83	2,290,687.26	12,216,428.90	349.7	Kansas
Kentucky	7,735,188.84	1,778,840.23	1,684,145.54	2,152,330.10	823,208.37	6,438,524.24	1,296,664.60	4,709,064.48	200.4	Kentucky
Louisiana	4,883,952.82	784,376.39	890,908.24	636,065.53	1,570,940.44	3,882,290.60	a 1,001,662.22	6,650,683.01	555.4	Louisiana
Maine	3,546,237.99	968,028.48	471,851.81	584,702.21	1,385,682.38	3,410,264.88	135,973.11	4,662,854.19	159.8	Maine
Maryland	1,740,687.09	529,854.25	594,063.15	378,147.75	183,216.36	1,685,281.51	55,405.58	5,171,378.31	179.7	Maryland
Massachusetts	5,070,258.83	1,238,036.28	749,812.71	859,882.98	775,899.56	3,623,631.53	1,446,627.30	6,213,006.99	150.5	Massachusetts
Michigan	11,972,754.31	3,315,338.39	3,297,505.69	1,468,987.26	2,619,212.88	10,701,044.22	1,271,710.09	9,425,833.46	357.3	Michigan
Minnesota	9,135,679.84	1,330,000.00	1,395,587.28	1,651,511.08	3,781,445.27	8,158,543.63	977,136.21	19,432,117.23	1,850.6	Minnesota
Mississippi	6,783,269.96	1,926,930.89	1,526,262.57	1,486,725.17	795,756.93	5,735,675.56	1,047,594.40	4,676,624.37	454.6	Mississippi
Missouri	14,146,057.07	1,716,941.49	4,854,650.29	2,364,118.18	978,053.74	9,913,763.70	acd 4,232,293.37	5,252,457.72	365.6	Missouri
Montana	6,830,227.51	2,501,700.25	267,464.27	361,401.62	1,196,967.48	4,327,533.62	2,502,693.89	7,721,927.30	691.6	Montana
Nebraska	9,374,267.76	69,761.29	1,205,347.20	2,985,190.84	852,513.03	5,112,812.36	4,261,455.40	2,960,405.90	435.7	Nebraska
Nevada	5,065,037.45	1,590,025.77	1,360,540.16	851,726.59	382,682.66	4,184,975.18	880,062.27	2,671,187.92	180.5	Nevada
New Hampshire	1,162,820.80	243,441.28	136,507.02	204,387.62	203,829.43	788,165.35	374,655.45	2,298,281.45	138.6	New Hampshire
New Jersey	4,491,376.66	1,477,154.55	353,965.61	723,421.46	475,271.15	3,029,812.77	1,461,563.89	4,230,573.04	95.0	New Jersey
New Mexico	6,513,353.64	651,331.99	1,288,786.29	868,872.73	1,390,385.69	4,199,376.70	a 2,313,976.94	4,422,257.26	541.6	New Mexico
New York	21,358,826.23	5,249,860.00	5,837,400.29	3,342,114.14	1,901,772.37	16,331,146.80	5,027,679.43	7,988,010.75	242.8	New York
North Carolina	7,991,906.08	911,647.00	1,568,473.23	714,564.72	2,720,747.81	5,915,432.76	2,076,473.32	11,770,363.76	826.8	North Carolina
North Dakota	6,545,068.65	823,246.35	624,749.58	1,122,823.72	1,823,371.20	4,394,190.85	2,150,877.80	5,083,460.20	783.2	North Dakota
Ohio	11,690,454.75	1,442,380.70	2,729,656.46	2,230,398.09	2,212,286.97	8,614,722.22	3,075,732.53	22,624,086.34	657.1	Ohio
Oklahoma	9,665,546.14	2,107,002.84	1,128,918.81	1,589,726.72	2,692,541.49	7,518,189.86	2,147,356.28	8,531,840.25	312.1	Oklahoma
Oregon	3,296,371.79	748,011.72	672,156.91	346,572.77	749,779.32	2,516,520.72	779,851.07	10,391,362.48	534.1	Oregon
Pennsylvania	12,863,492.56	89,586.25	1,658,690.82	2,547,589.18	3,797,684.09	8,093,550.34	4,769,942.22	31,833,725.20	630.0	Pennsylvania
Rhode Island	1,017,335.73	377,412.26	136,245.34	.....	97,554.56	611,212.16	406,123.57	1,484,075.35	38.6	Rhode Island
South Carolina	4,780,505.25	367,243.76	1,161,057.23	1,078,913.31	968,481.36	3,575,695.66	1,204,809.59	6,052,909.19	644.6	South Carolina
South Dakota	6,809,916.98	1,157,369.31	974,315.46	1,440,980.51	1,513,409.18	5,086,074.46	1,723,842.52	4,544,575.48	502.9	South Dakota
Tennessee	9,808,998.59	509,050.88	3,648,282.74	3,592,442.33	654,750.38	8,404,526.33	1,404,472.26	2,597,846.43	98.1	Tennessee
Texas	22,586,104.03	2,998,974.65	4,627,061.32	4,070,752.97	5,765,310.61	17,462,099.55	5,124,004.48	27,592,830.05	2,117.7	Texas
Utah	5,002,231.20	383,195.42	1,020,482.10	1,131,378.68	929,937.78	3,464,993.98	1,537,237.22	2,175,007.41	116.6	Utah
Vermont	1,904,389.91	61,970.18	257,870.82	198,925.94	405,469.93	924,236.87	980,153.04	1,370,715.63	53.1	Vermont
Virginia	7,840,772.19	1,488,678.97	2,092,015.37	1,338,547.79	1,796,793.29	6,716,035.42	1,124,736.77	6,490,235.72	385.8	Virginia
Washington	2,990,110.72	.....	781,611.86	91,838.14	1,035,846.59	1,909,296.59	1,080,814.13	10,356,980.82	419.8	Washington
West Virginia	3,763,692.75	437,882.88	841,708.77	1,242,932.35	587,650.21	3,110,174.21	653,518.54	4,047,416.94	204.0	West Virginia
Wisconsin	7,932,385.48	158,599.76	383,426.14	540,453.65	1,989,900.10	3,072,379.65	4,860,005.83	15,206,000.01	1,057.8	Wisconsin
Wyoming	4,606,888.11	512,290.10	1,252,188.00	701,389.47	1,066,683.44	3,532,551.01	ad 1,074,337.10	4,601,439.36	534.8	Wyoming
TOTALS	$349,681,202.23	$57,980,850.49	$73,557,834.48	$63,010,898.85	$64,752,975.73	$259,302,559.55	$90,378,642.68	$391,556,800.41	22,311.9	TOTALS

NOTE: a—Reduction due to payment of final vouchers. b—Correction. c—Reduction due to withdrawal or cancellation of projects. d—Difference due to revision of project statement or agreement estimates. *Amounts paid on projects completed prior to July 1, 1922 deducted.

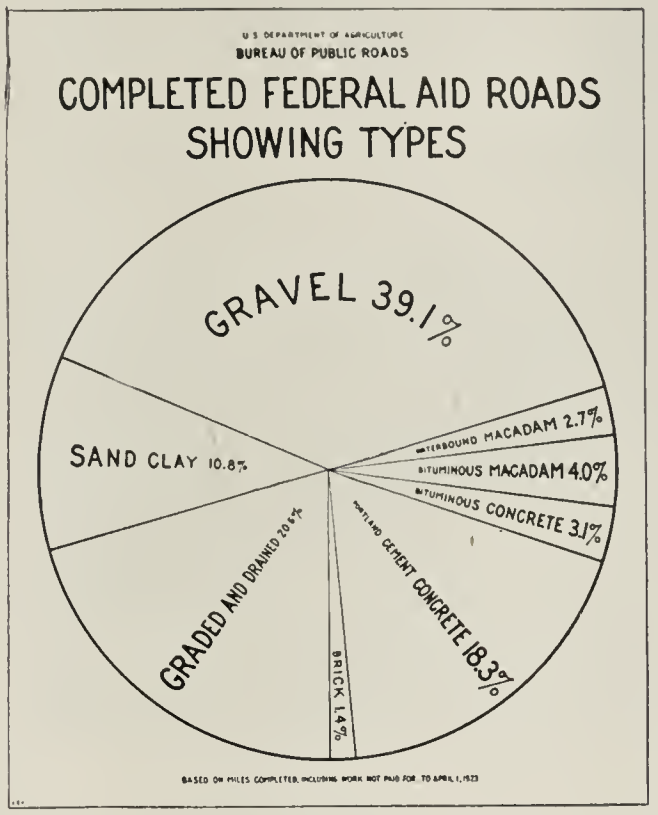
Grant Pass in Oregon; and the Sierra Nevadas will be crossed at Truckee and Walker passes in California.

Routes to Give Service

"In designating the routes to be included in the federal aid system the chief aim of the states and the federal agency has been to select routes which will give the maximum of local service and at the same time connect with one another to form a great national highway system. The states were first asked to certify the total mileage of road in existence at the time the act was passed. Seven per cent of this was the maximum allowable mileage that could be included in the system. The total was 194,262 miles. The states were then asked to prepare maps of state systems proposed by them, locating the roads by controlling points. These state systems were carefully reviewed and studied by the department and some changes were suggested as being desirable from the national point of view. Conferences were held between representatives of the department and of states and groups of states, and out of these conferences came agreement as to the systems finally decided upon.

"Federal aid for road building was inaugurated by the federal aid road act, approved July 11, 1916.

"Since the above date $540,000,000 have been appropriated or authorized for the fiscal years 1917 to 1925, inclusive. Of the above amount $75,000,000 is authorized for the fiscal year 1925 and will not be available for expenditure until July 1, 1924. Sixty-five million dollars is authorized for the fiscal year beginning July 1 of this year, leaving $400,000,000 authorized or appropriated for expenditure up to the current fiscal year.


U S DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS
COMPLETED FEDERAL AID ROADS
SHOWING TYPES
GRAVEL 39.1%
SAND CLAY 10.8%
WATERBOUND MACADAM 2.7%
BITUMINOUS MACADAM 4.0%
BITUMINOUS CONCRETE 3.1%
PORTLAND CEMENT CONCRETE 18.3%
BRICK 1.4%
GRADED AND DRAINED 20.5%
BASED ON MILES COMPLETED, INCLUDING WORK NOT PAID FOR, TO APRIL 1, 1923

"Of the $400,000,000 authorized or appropriated up to the current fiscal year $226,274,214 had been paid to the states for work completed up to March 31, of which $160,938,223 was paid on projects completed and accepted, and $65,335,991 had been paid in progress payments for work completed on projects which were still under construction on March 31.

"On March 31, 21,638 miles had been completed at a total cost of $378,087,845, and the federal share of the cost amounting to $160,938,223 had been paid to the states.

"On the same date 3,413 miles additional had been completed but they had not been inspected for final acceptance. The total cost of these roads was approximatly $51,500,000.

"On the same date there were 14,010 miles under construction and these roads were reported at the time as fifty-six per cent complete in the aggregate.

"The total mileage completed or under construction on March 31 was 39,062 miles.

"While the improvement of the federal aid system may proceed more slowly than some would like, and more slowly than it would under more favorable economic conditions. nevertheless almost before we realize it we shall find that we have a federal road system which will not only serve local needs, but which will make it possible for the tourist to drive from one end of the country to the other and from one part of any state an another, in the assurance of finding good roads the entire distance."

Building Forecasts to Stabilize Construction

The General Public to Be Constantly Informed of the Construction Situation in the United States

WASHINGTON, June 25—Secretary of Commerce Hoover has given his approval to the plan of the American Construction Council to publish weekly forecasts of conditions in the different branches of the building industry throughout the country. Mr. Hoover at a conference with a committee representing the council in New York, promised the cooperation of the Department of Commerce in supplying such data as it collects for use in preparing the weekly forecasts. It was Mr. Hoover's opinion that it was preferable for a private organization to issue statistical matter of this character rather than for the government to do so. The American Construction Council will obtain much of this material from the building contractors and others who are in a position to give direct information on the demand for different materials. Conditions in the cement industry are expected to be covered fully in the weekly forecasts which will be issued from the offices of the Council in New York.

Secretary Hoover gave his approval to the program of the American Construction Council in the following statement:

"I have gone thoroughly over the plans of the American Construction Council by which they propose to keep the general public constantly informed of the situation as regards construction in the United States, and they have my full endorsement and hearty approval. The Department of Commerce will gladly cooperate in this work with the American Construction Council in every way."

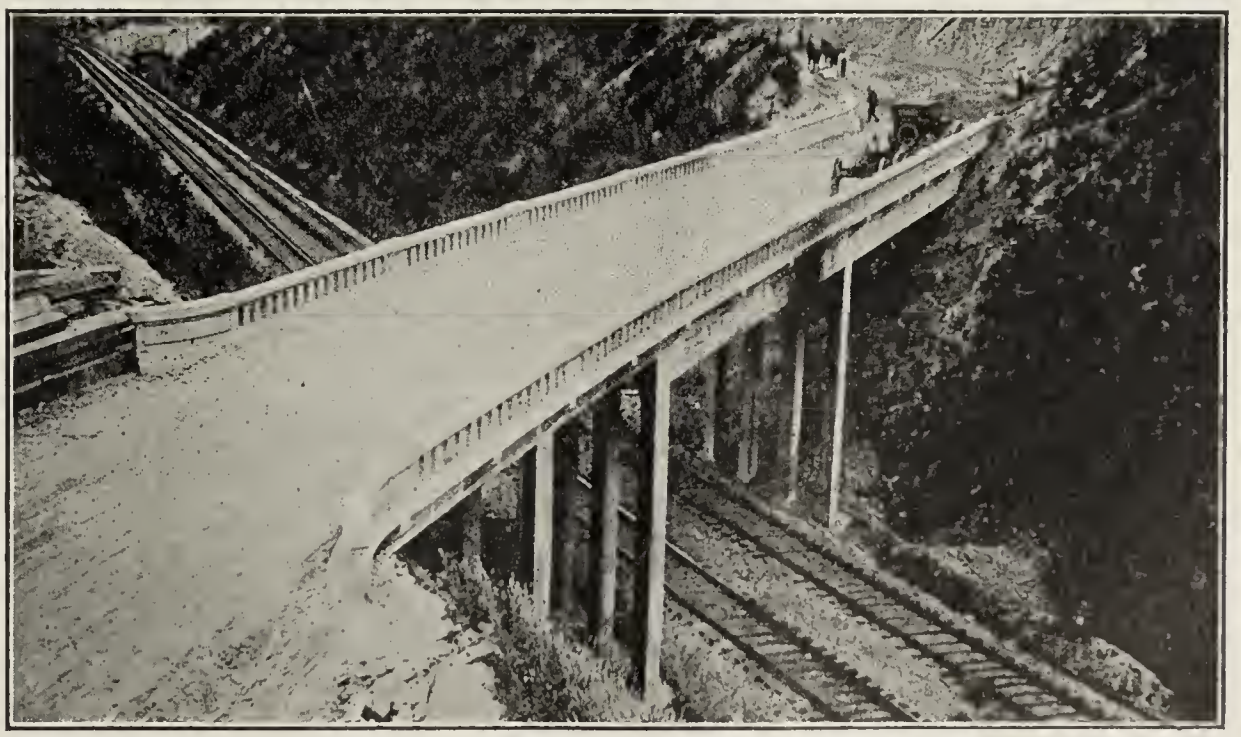
Statistical Activities

As a result of Secretary Hoover's discussions with representatives of the building industry he is giving consideration to an extension of the departmental statistical activities. One of the proposals is that the 1923 census of manufactures shall include a tabulation of construction contracts and materials called for under the contracts. The feasibility of gathering this information is being carefully gone into by officials of the Census Bureau, which is under Mr. Hoover's supervision.

The special committee of the American Construction Council with which Mr. Hoover conferred was composed of General R. C. Marshall, Jr., general manager of the Associated General Contractors of America, headquarters of which is in Washington; Edwin F. Gay of the New York Evening Post; M. C. Rorty, president of the National Bureau of Economic Research, and Noble Foster Hoggson, chairman of the Council's executive committee.

The plans of the American Construction Council for publishing weekly forecasts in the building industry were announced by Franklin Roosevelt, president of the Council, as follows:

"The plan developed and which has been approved by the Secretary of Commerce



A safe and sane way to cross railroad tracks. This concrete overhead bridge is one of those built on the Federal Aid road project.

A typical Illinois Federal Aid road with a concrete surface.

consists, broadly, in the gathering by a special department of the Construction Council, of a vast amount of data from the constructors and material manufacturers, and adding them to special statistics obtained from government sources through the cooperation of Mr. Hoover's department and from the Chambers of Commerce throughout the United States. These figures, analyzed and simplified by experts appointed by the council, will form the basis of a weekly forecast of construction conditions, so far as the demand and availability of material is concerned.

"From the Department of Labor, which is in thorough accord with this plan, we will receive information as to the availability of labor, skilled and unskilled, for construction purposes throughout the United States.

"The forecast which we will issue will not be technical in its character, and while it will cover the entire country the information will be also segregated into distinct districts, so that any one intending to build can not only see at a glance how conditions are nationally, but in his particular locality as well. In other words, we will follow largely the plan adopted by the Weather Bureau in giving national conditions, and then conditions by locality immediately following. These general forecasts will be distributed throughout the public press Monday of each week. In addition, the American Construction Council will publish at a nominal price a special weekly bulletin which will contain in greater detail the reports and data on which the forecast is based. It will be the endeavor to make this bulletin of great practical service, not only to those whose business is concerned with construction, but to all considering any construction work of considerable magnitude.

"I want at this time to emphasize that the principal object of this phase of the work of the Construction Council is to permanently prevent the 'peaks and valleys' in the construction industry, of which the present situation is typical and which has resulted disastrously in the past, both to those who build and supply building materials and those who erect structures of all kinds. I also want to make clear that the American Construction Council is emphatic in its belief that if unnecessary building should be retarded for a short time, the work of necessary home building can go forward under reasonable conditions of cost."

Gen. Marshall believes that the action of the American Construction Council in adopting the stabilization program in May calling for a restriction of building activities has already produced results. Reports reaching Gen. Marshall have indicated a postponement of construction contracts aggregating a value running into hundreds of millions of dollars. Gen. Marshall said that as indicative that a runaway market is not threatened to the same extent as a few weeks ago he has been informed by some of the contractors that building material supply men are soliciting orders. A few weeks ago supply men were unable to handle orders coming to them unsolicited.

A Restrictive Program

Gen. Marshall has explained the purposes of the restrictive program of the American Construction Council in the following statement prepared at the invitation of the National Lumber Manufacturers' Association:

"Considering the purchasing power of the dollar today, as compared with 1913, building costs are not now prohibitive, but we are menaced by dangerous inflation. According to our index figures the cost of building in the spring of 1920 was about 55 points higher than it is now (1913 taken as 100; 1920 was 255 and 1923 is 200) and building material prices were about 90 points higher—index figures on a 1913 base of 100 being 300 for 1920 and 310 for 1923. While building trade wages are at the moment about 75 points higher than in 1913, they are not quite so high as they were in the latter part of 1920 and first part of 1921, but as labor efficiency falls off with increasing wage rates, labor production costs are rapidly mounting. The trend is unmistakably toward heavy increase in the total of building costs. The building permits issued in 200 cities in March amounted to $397,000,000, an increase of about 50 per cent over March, 1922, and the volume of building now in progress dwarfs any previous records in the history of the country, being almost 75 per cent greater than at any other time.

"We are undertaking this enormous expansion of building with a stationary if not shrinking labor supply, on account of the immigration restriction law, and with the material industries of the country practically at the limit of their productive capacity. There can be only one outcome of such a situation if it is allowed to persist. The cost of materials and labor will presently rise to prohibitive levels, and our enormous construction program will collapse with a crash. If history is a good guide, it will take two or three years to recover, in spite of the fact that we are still at least a year's normal building behind the housing requirements of the country.

"It is commonplace to say that all industry is vitally related to construction. If this industry tumbles from an extraordinary peak of activity to a depth of extraordinary depression, the general results will be reflected in all the country's industry and commerce.

To Equalize Supply and Demand

"To us who are so situated as to see the hand writing on the wall, there was no other choice than to attempt consciously to check the rise in building costs before they became prohibitive and destructive. We calculate that if all building projects for speculative selling can be deferred for a few months, and also all other large construction projects that are not of an emergency nature, we shall effect something of an equilibrium between supply and demand in the construction industry, and will be able to stabilize costs at present or, possibly, slightly lower levels. If we do this we think that about eighteen months of exceptional prosperity can be counted on in the construction trades, and that from then on the building industry will be able to gradually and comfortably meet the new construction needs of the country. As we see it, the question simply is,—Will the country 'go easy' on new building for two or three months and thereby insure itself a year and a half or more of exceptionally good business, without a terminal explosion resulting in widespread ruin and distress; or will it insist on plunging into a mad carnival of rising costs and supernormal building volume which is sure to blow up in a few months and to be followed by two or three years of ruinous prostration?

"This attempt to prevent a giddy cost peak from which there will be no way down but a suicidal leap, is something new in what you might call applied economics. It may not succeed and there may be untoward developments, but we are convinced that nothing that may come from this conscious effort to prevent disaster will be as bad as the disaster itself. Doubtless the restrictive policy may work hardship on many industrial plans and some workers, but of course in a general program of this kind, it is impossible to do individual justice to thousands and tens of thousands of cases involved. We can only hope to attain the general good, and that present individual sacrifices will be more than offset in the compensating benefits that will ensue. So far the appeal for the deferment of construction, wherever possible, has been generally responded to. Hundreds of millions of dollars of projects have been held up and the present prospect is bright that we shall be able to flatten out the ominous impending peak."

Federal Reserve Comments

The June issue of the Federal Reserve Bulletin comments on the building situation as follows:

"While the general level of wholesale prices in April, 1923, as measured by the Bureau of Labor Statistics, was 59 per cent above pre-war figures, the level of building material prices was 104 per cent

(Continued on page 48)

Pavements with Thickened Edges

The thicker-at-the-edges design for concrete pavement, though it has been used in a modified way in the earlier days of concrete road building, has only recently been accepted as an important improvement in concrete pavement design. Since its first extensive use in Maricopa County, Ariz., the thicker-at-the-edges section has proved its worth in the Pittsburg Test Road; its necessity was demonstrated in the Bates Experimental Road and it has been adopted, with slight variations, as the standard design in several state and county highway departments.

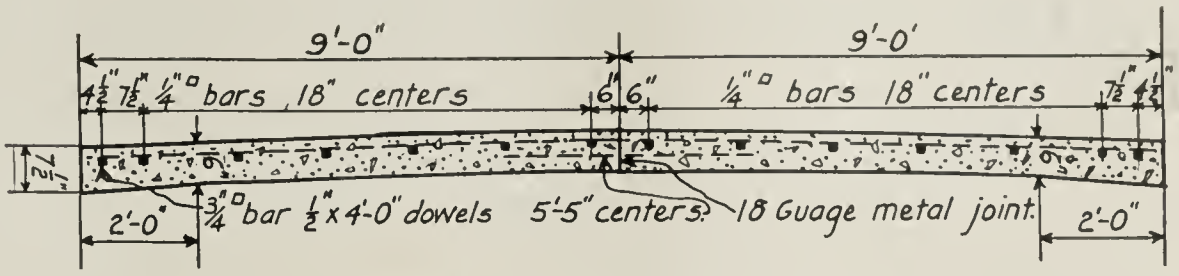
Probably the first concrete pavement with heavier edges were built in Wayne County, Mich. The thickened edge was in reality an inverted curb which was placed to provide additional strength at the edge where the corner was rounded to make it easier for vehicles to get on and off the pavement. Other examples of the use of inverted curbs or beams under the edges of concrete pavements were found in California, in Cuyahoga County, Ohio, and Chautauqua County, New York. In all of these cases, the additional support at the edges was provided to meet some particular condition, such as an especially insecure subgrade. They constituted a special precaution and were not considered necessary under ordinary conditions.

The general trend in standard road sections was in the opposite direction—thicker at the center than at the edges. This was probably caused by the desire to get away from the crowned subgrade which was more difficult to construct accurately and which was thought by some engineers to be responsible for the formation of longitudinal cracks. But it was soon found that one of the most prolific sources of trouble was the tendency of concrete roads too narrow for the volume of traffic to be served to break at the edges and at the corners of slabs. Added strength given to the center of the slab seemed misplaced in view of the greater volume of traffic forced to travel near the edges.

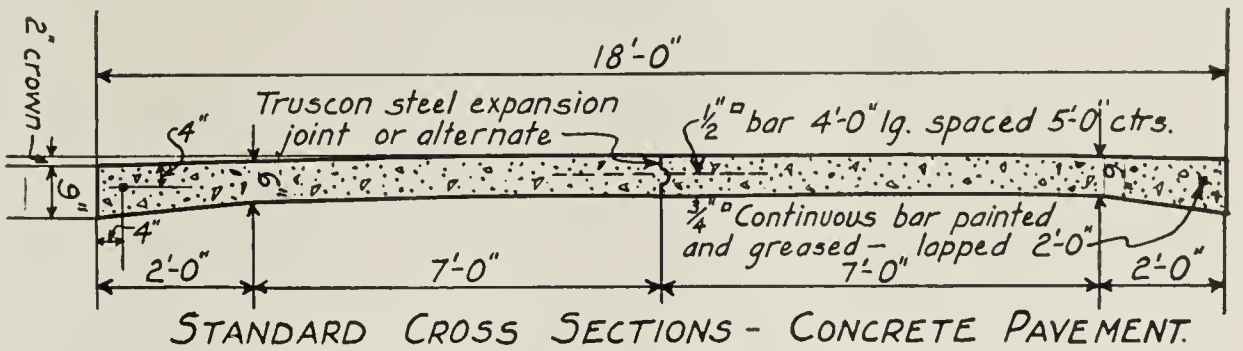
Maricopa County, Ariz., was the first to undertake, on a large scale, the construction of concrete pavements having thickened edges. The section adopted became known as the Maricopa Section and was selected as standard for that county's 309-mile concrete highway system which was begun in 1920. How well the Maricopa Section served traffic is shown by a recent thorough inspection. There was an almost complete absence of corner breaks in spite of the fact that as soon as the pavements were opened to traffic, they were used by heavily loaded material trucks weighing about twelve tons which traveled on the extreme edge of the pavement.

While the Maricopa County pavements were under construction, a test road containing thirteen different designs of concrete pavement was being constructed at Pittsburg, Calif. Four sections were constructed with thickened edges and one of these was of the Maricopa design. The road was subjected to intensive traffic so that the behavior of the various designs could be studied and compared. It was found, among other things, that the edges of the slabs appeared to be the most vulnerable places and that most of the breaking started at the edges or the joints. Sections with thickened edges made the most favorable showing in spite of the fact that these were built without reinforcement.

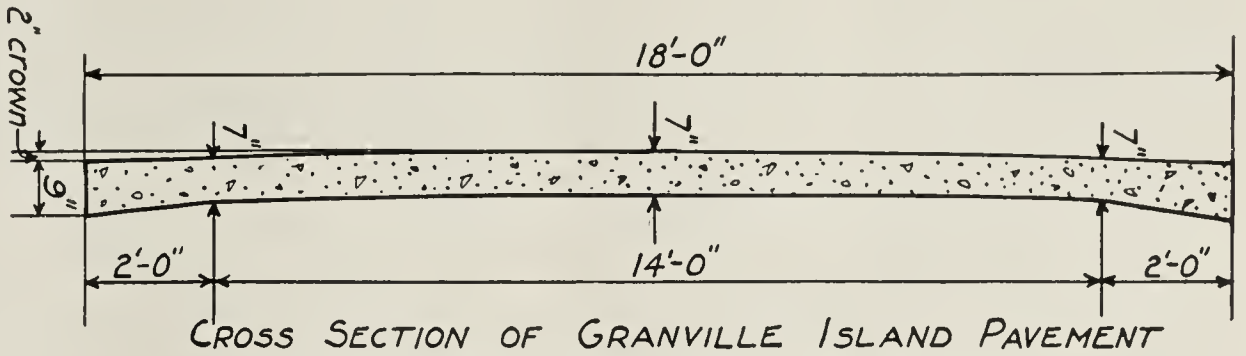
Tests made at the Bates Experimental Road near Springfield, Ill., under the direc-



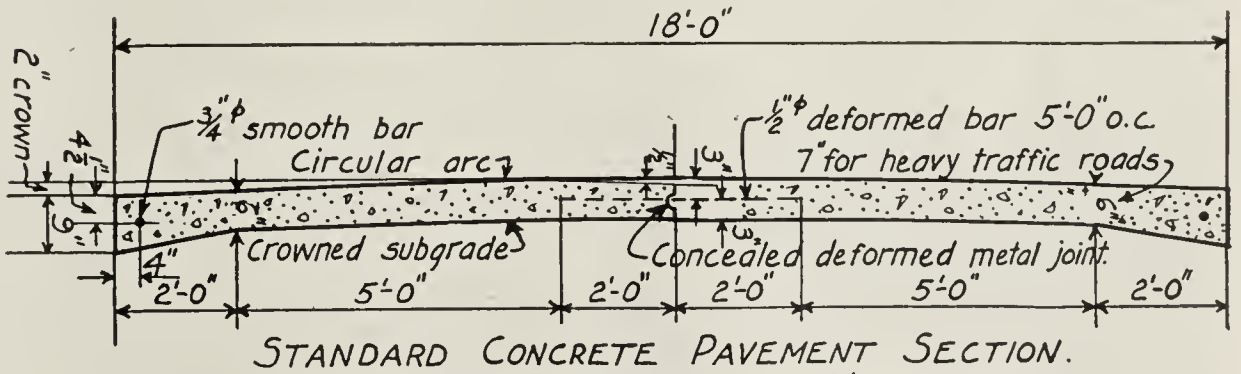
CONCRETE PAVEMENT SECTION
STATE HIGHWAY Nº 40 TARRANT COUNTY, TEXAS



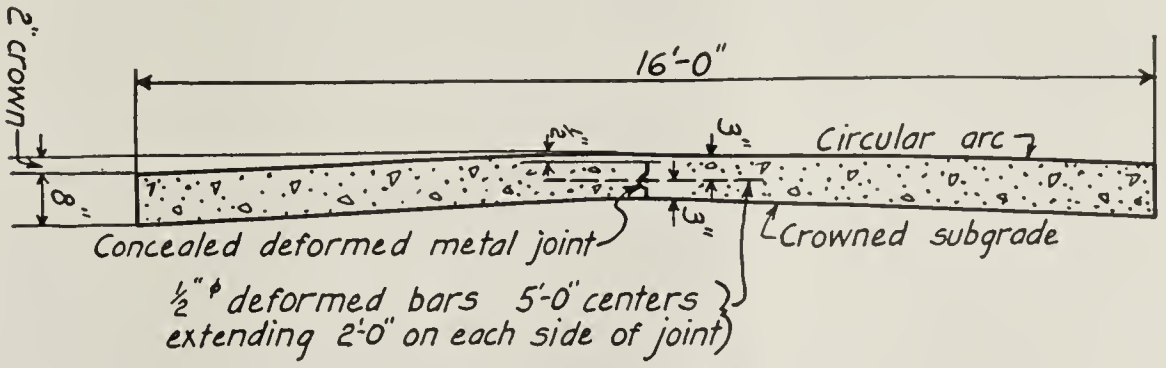
STANDARD CROSS SECTIONS - CONCRETE PAVEMENT.
7 UTAH STATE HIGHWAY COMMISSION



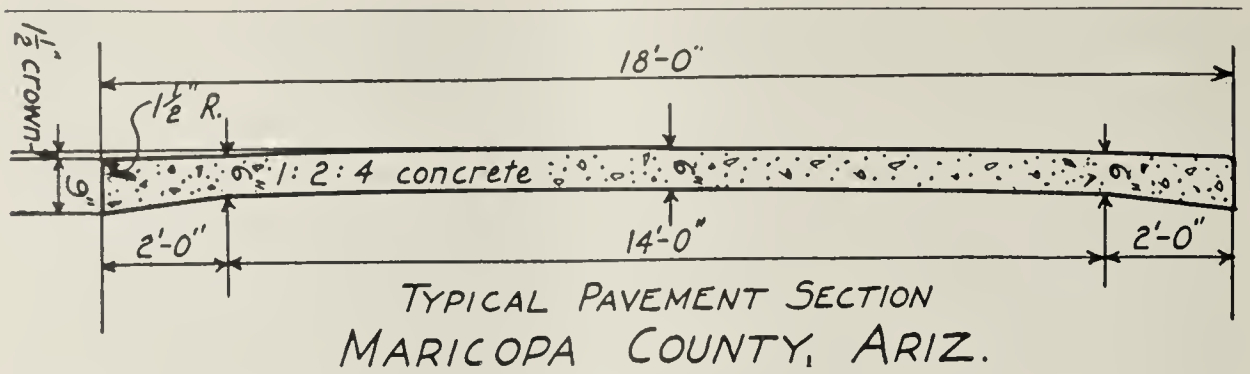
CROSS SECTION OF GRANVILLE ISLAND PAVEMENT
VANCOUVER HARBOUR COMMISSION



STANDARD CONCRETE PAVEMENT SECTION.
ILLINOIS DIVISION OF HIGHWAYS.



TYPICAL CONCRETE PAVEMENT SECTION
DELAWARE STATE HIGHWAY DEPARTMENT



TYPICAL PAVEMENT SECTION
MARICOPA COUNTY, ARIZ.

the Bates Road sixty-three sections of various types and designs were subjected to traffic and the results carefully studied. Though there were no sections with thickened edges in the Bates Road, the test showed conclusively the need for greater strength at the edges. Commenting on this feature, Clifford Older, Chief Engineer of the Illinois Division of Highways, said: "Rigid pavements having a uniform thickness or edges thinner than the center are greatly unbalanced in strength and will fail along the edges long before wheel loads are reached which will cause the destruction of other portions of the slab. Although fifty of the original sixty-three sections of the Bates Road either were completely destroyed, or sustained decisive local breaks, not one case of serious partial or complete failure of a rigid section occurred that was not directly due to the lengthening and widening of one or more small broken corner areas.

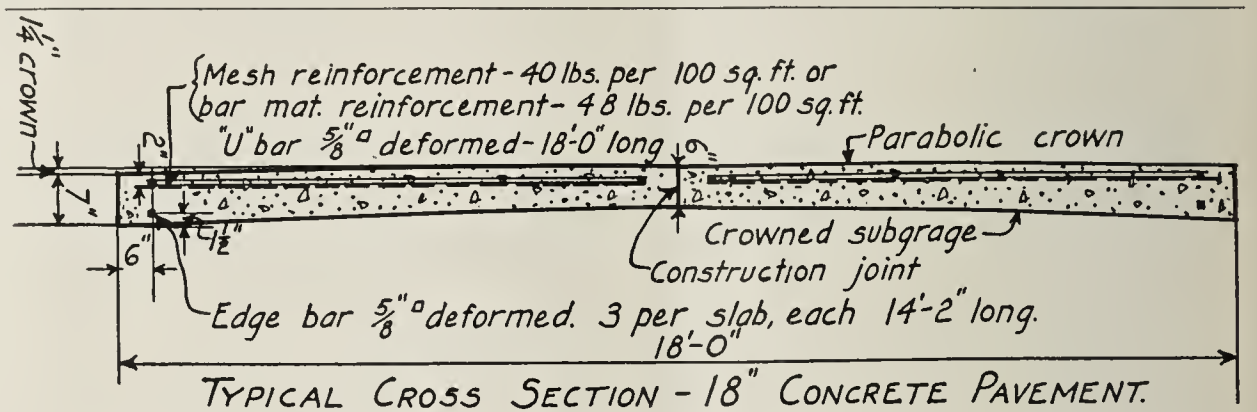
"The comparative absence of destruction along the north edge of the road where the wheels, except during the first and a portion of the second increments, traveled three feet from the edge is striking. * * * Increasing the edge strength of pavements of ordinary width should therefore be of first importance in design."

On the strength of these experiments backed by the results at the Pittsburg Test Road, the condition of the Maricopa County pavements and theoretical computations, the Illinois Division of Highways changed its standard concrete pavement section tion of the Illinois Division of Highways, substantiated the findings at Pittsburg. In from a 7-inch uniform thickness to the cross section shown is the accompanying illustration, having a thickness of 9 inches at the edges and tapering to 6 inches two feet from the edges. For roads to carry especially heavy traffic, or for bad subgrades, the central part of the slab will have a thickness of 7 inches, with the 9-inch edge.

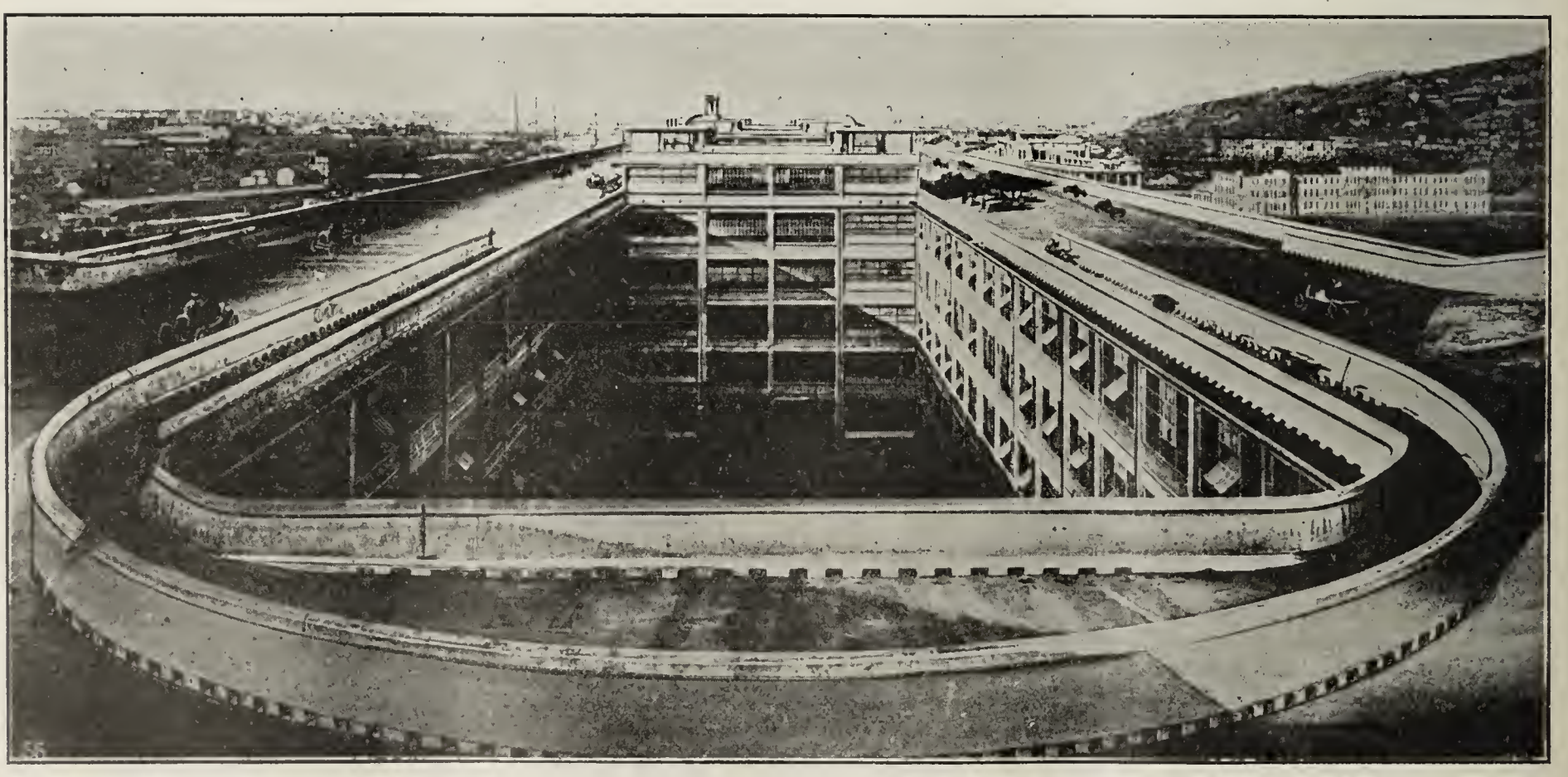
To verify these conclusions, five new sections of concrete were added to the Bates Experimental Road. Four of these have edges thickened to 9-inches with 5 and 6-inch centers, the other being the old standard section of 7-inch uniform thickness. Truck traffic is now testing these new sections and results to date have convinced Mr. Older that the adoption of the new design was justified.

It is also significant that the new Illinois standards require the same mixture as required for concrete roads (1:2:3½), and identical cross-section for concrete bases for asphaltic tops, including the marginal rods and center joint. For bituminous filled brick, the concrete base is specified to be 6½ inches thick, 1:2:3½ mix, marginal rod, center joint, with a marginal curb 8 inches wide, 4 inches deep, monolithic with the base. For monolithic brick, the base, including the mortar bed, is 5 inches thick, but curbs, marginal rods and center joints are not required.

Since Illinois has changed to the thicker-at-the-edge section, other state and county highway departments have adopted similar designs. Accompanying illustrations show cross sections now being used by New York, Delaware, Utah, Tarrant County, Texas, and by the Vancouver (B. C.) Harbor Commission. Other highway departments using similar designs are the state of Virginia, the District of Columbia and Caddo Parish, La. While the individual designs of these sections differ in their details, all of them make use of the newly accepted principle that the edges of the slab require greater thickness than the center—*Concrete Highway Magazine.*


1¼" crown
Mesh reinforcement - 40 lbs. per 100 sq. ft. or
bar mat. reinforcement - 48 lbs. per 100 sq. ft.
"U" bar 5/8" ø deformed - 18'-0" long
Parabolic crown
2"
7"
6"
1½"
Crowned subgrade
Construction joint
Edge bar 5/8" ø deformed. 3 per slab, each 14'-2" long.
18'-0"

TYPICAL CROSS SECTION - 18" CONCRETE PAVEMENT.
STATE OF NEW YORK - COMMISSION OF HIGHWAYS



This picture shows the roof of a famous manufacturing plant in Turin, Italy. Because of the small amount of space available and the mountainous country surrounding the plant engineers for the company constructed a special testing track on the roof of the building, about three-quarters of a mile in length. By means of a special arrangement cars can run off and on the track without interfering with the racers. The curves aboth ends are constructed in the same way as other tracks in having a high embankment. A high wall protects the drivers from going over the roof.

Discouraging the Duplication of Orders

What the Associated Contractors Have to Say Anent the Practice of Over-ordering on Cement Supplies

WASHINGTON, June 28.—A defense of construction companies against the charge of cement manufacturers that there has been a widespread over-ordering and duplication of orders for cement is contained in a letter sent to Secretary of Commerce Hoover by the Associated General Contractors of America, Inc. It is declared that while over-ordering or the duplicating of orders does occur to a limited extent it does not amount to more than ten per cent of actual needs instead of forty per cent as claimed by the cement manufacturers. Conditions are described which it is asserted by the contractors makes it inevitable that construction companies at times must over-order as a means of self-preservation.

The reply of the Associated General Contractors of America, Inc., was called forth by a letter sent to Secretary Hoover by Lowell R. Burch, vice president of the Atlas Portland Cement Company; Morris Kind, president of the Hercules Cement Corporation; W. E. Erdell, president of the Penn Allen Cement Company; Joseph Brobston, vice president of the Dexter Portland Cement Company; E. M. Young, vice president of the Lehigh Portland Cement Company; and G. S. Brown, president of the Alpha Portland Cement Company. Secretary Hoover transmitted this letter, which was dated April 9, to the Associated General Contractors of America, Inc., for their comment. The executive committee of the organization directed General R. C. Marshall, Jr., general manager, to institute an investigation which resulted in the preparation of the letter just sent to Secretary Hoover.

The text of the letter of the Associated General Contractors of America to Secretary Hoover signed by J. W. Cowper, president, and twenty other members of the executive committee, under date of June 25, follows:

"Upon receipt of your communication of April 25, enclosing a letter from cement manufacturers, relative to the over-ordering of their product by contractors, an immediate effort, as previously indicated, was made by the Associated General Contractors to discourage this practice; and steps were taken to investigate the question of its prevalence, the causes for over-ordering and the possibility of finding a permanent remedy.

"The investigation has been carried far enough to reach certain conclusions which are herewith transmitted as a reply to the principal points relative to construction operations mentioned in the letter of the cement manufacturers. These points made either directly or by inference, as we interpret the communication, are as follows:

"FIRST—Construction companies either through excessive caution or a desire to speculate at the expense of manufacturers, contract for cement, greatly in excess of their requirements—the excess amount as indicated by a number of cases investigated, averaging 40 per cent of the actual needs.

"SECOND—Cement is sold, presumably against the desire of manufacturers, under a fixed price 'specific job contract,' which is cancellable by the contractor, but to which the manufacturers submit as a protection to the public against the evils of speculation.

"THIRD—The demand for cement should be more uniformly spread and over-ordering or other wasteful and selfish methods in the building industry should be abandoned if the industry is to function properly.

"In reply to these points, the following analysis is offered:

"FIRST—Over-ordering or the duplicating of orders does occur to a very limited extent when construction companies are bound by a completion time limit and penalty, under a contract which grants no extension of time for delay in material delivery, or where such delay introduces excessive costs; but no instance has so far been found where over-ordering was practiced merely as a means of speculation. None of the signatories to this communication has knowingly over-ordered cement for any purpose or encountered the practice directly among other members of the industry.

"The volume of cement used by contractors has been estimated by the cement manufacturers at 40 per cent of their output and if all contractors over-ordered 40 per cent, the excess orders would equal some 16 per cent of the total production. That all contractors do not over-order 40 per cent is obvious. Ten per cent is probably an excessive average, and this amount, in so far as construction companies are concerned, would represent excess orders of about four per cent of the total production.

"SECOND—Cement is almost universally sold under a loose form of contract, which guarantees the price, but which does not bind the seller to deliver a given quantity of material within a given time. Therefore, since the construction company is almost invariably bound to its client under a time of completion penalty, and also faces an excessive loss from delayed material, it commonly occurs that the time element is a more vital factor than a reasonable variation of price. In other words, the construction company sells short on time as well as on price and under the existing form of material contract, it cannot cover itself against non-delivery.

"It is important to take cognizance of the fact that on certain types of highly organized construction work, notably highways, which depend upon continuity of material delivery for their success, a delay in material delivery may entail an unavoidable overhead expense of from $30.00 to $50.00 per hour. Such an unproductive expenditure is capable of ruining almost any construction company and they dare not trifle with the question of delayed material. If the manufacturer and the dealer, who receives a commission on all cement used in his territory, will assume responsibility for delivery at a given time, the practice of over-ordering or duplicating can doubtless be eliminated. It has birth in the trade practices of cement selling and upon revision of these practices depends its correction. Under existing conditions, it is surprising that the extent of over-ordering is not greater.

"Since the manufacturer does not agree to deliver at a given time or rate and since the owner demands his project at a given time, the construction company is obliged to accept responsibility for contingencies which neither of these will assume. In the construction of a modern office building, there may be a score of industries which pass this same contingency along to the construction company, and it is almost inevitable therefore, that as long as the present form of material contract exists, construction companies here and there will over-order as a means of self preservation.

"The present form of contract employed in the purchase of cement and various other material is no instrument of construction companies. In fact, they are repeatedly injured by its use and have sought its abandonment. Construction is salted with such instruments, which in the public interest, as well as in the interest of the industry, should be substituted by a system

The Columbia Pike concrete road constructed by the Bureau of Public Roads for experimental purposes.

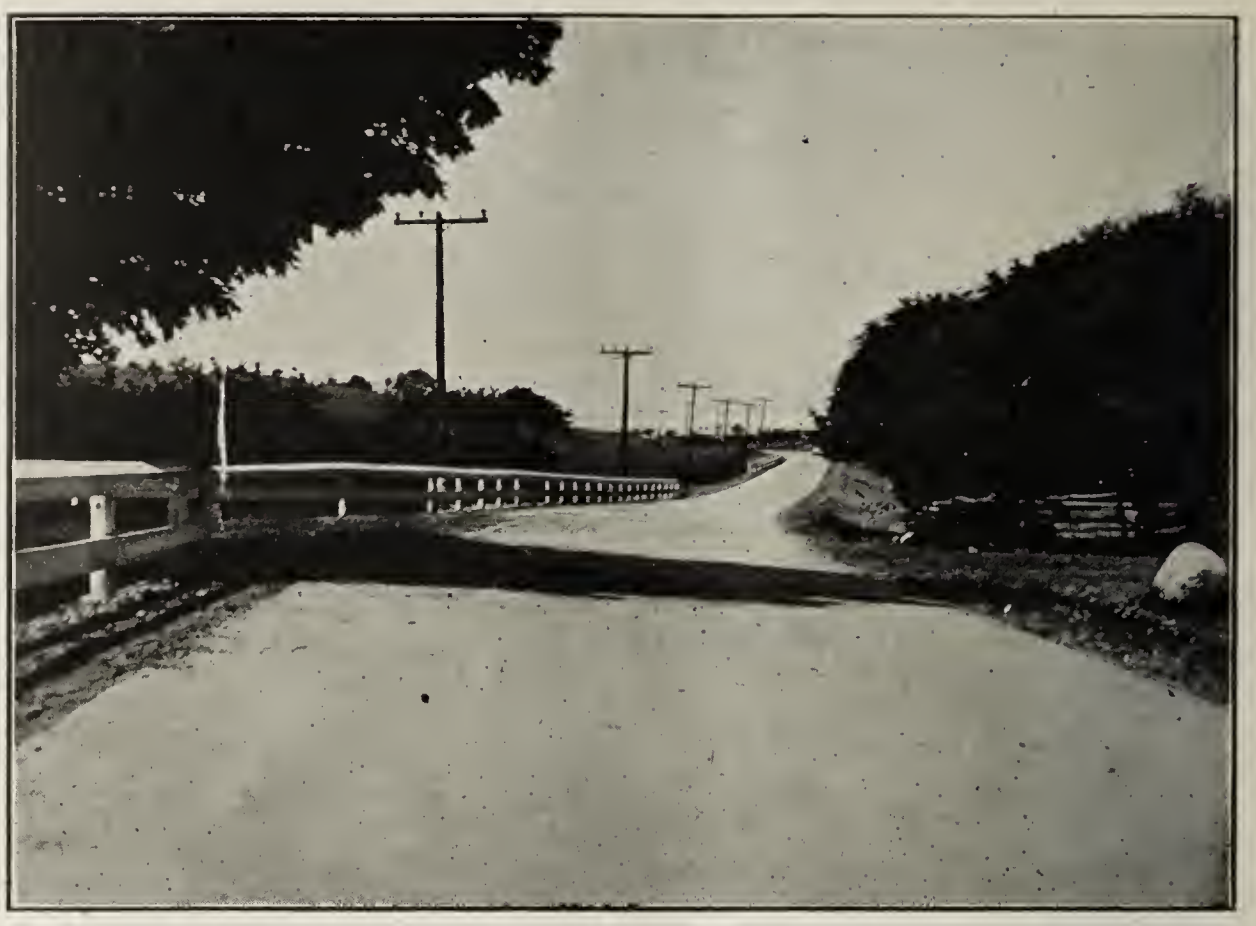
of bona fide mutual contracts, harmonizing with the major construction agreement.

"Reliable construction companies have often sought to enter a bona fide non-cancellable contract guaranteeing delivery and acceptance, and relieving seller from delays of transportation, but this offer has been declined. In certain instances where the inability to deliver cement was attributed to lack of transportation, and construction companies offered to provide transportation off dock either by water or rail, these companies were found to be over sold and could not deliver. Over selling as well as over-ordering is an important factor in the expansion period of the construction industry. Any recession of the manufacturers, not only of cement but of other materials, from a stand against the adoption of mutual, non-cancellable sale contracts will unquestionably meet with sincere cooperation from the country's construction companies.

"THIRD—The cement companies make a sound constructive suggestion that the demand for cement be more uniformly distributed and that all wasteful and selfish practices in the industry be abandoned. To this there is but one answer—a cooperative examination of existing methods, impartial analysis of the economics and ethics involved and a sincere effort on the part of each industry to govern itself with due regard for commercial rights of every other. It was partly to institute a move in this direction that an open conference of those industries involved in construction was sought last February by the Associated General Contractors.

"The general tone of the cement manufacturers' letter and the date of its writing lead one to infer that it was conceived in opposition to a construction conference; but whether this is true or not we venture to suggest that such conferences are an essential factor of the cooperative stage into which industry is emerging. With rapid strides, the trade association is casting aside many features of the competitive system and has reached that stage of group cooperation where the principal evils of the competitive plan still survive, but where the public has not derived its share of benefit from the cooperation.

"To give the public this benefit, ethical conduct within the individual industries and control of the business cycles are essential, and we desire to see these possibilities developed within construction.



A view of the trunk line road No. 11 in Ocean County, Michigan. This sixteen-foot plain concrete road was built in 1921.

Cyclical control in this industry has been proved feasible within the past two months, and there is little excuse for allowing it to repeat the rampage of 1920. This entire question is interlocked with the problem of inducing industries as units, to exercise proper government of themselves and to share the burden of adjusting a changing system of economics. If this course is not followed voluntarily, it will doubtless be followed under the distasteful pressure of law.

"We believe that all data compiled by trade associations in connection with cooperative action of their members be made available to the public and that the councils of these associations be thrown open to any interested governmental official or other citizen of the country."

The contractors signing the letter were the following:

J. W. Cowper, president, John W. Cowper Company, Buffalo, New York, president, Associated General Contractors of America. F. L. Cranford, president, Frederick L. Cranford, Inc., Brooklyn, New York. James E. Cashman, treasurer, Bay State Dredging & Contracting Co., Burlington, Vt. Noble Foster Hoggson, president, Hoggson Brothers, New York. Leonard C. Wason, president, Aberthaw Construction Co., 27 School St., Boston, Mass. L. D. Townsend, president, The Townsend-Shuttleworth-Ballines Company, Lansing, Michigan. H. H. Wilson, managing partner, Winston & Co., Muncy, Pa. R. B. Allport, president, Allport Const. Corp., Richmond, Va. D. B. Fegles, general manager, Fegles Construction Co., Ltd., Minneapolis, Minn. E. R. Shenk, vice president, Henry Shenk Company, Erie, Pennsylvania. C. W. Lundoff, president, The Lundoff-Bicknell Co., Cleveland, Ohio. Alex. Simpson, Jr., Alex. Simpson, Jr., Co., Denver, Colorado. W. O. Winston, chairman of the board of directors, Winston Bros. Company, Minneapolis, Minn. W. F. Creighton, president, Foster & Creighton Co., Nashville, Tenn. R. R. Kitchen, R. R. Kitchen & Co., General Contractors, Wheeling, W. Va. Walter A. Rogers, president, Bates & Rogers Const. Company, Chicago, Ill. J. H. Ellison, vice president, Winston Dear Co., Minneapolis, Minn. Frederick Ward, president-treasurer, Ward & Tully, Inc., Brooklyn, N. Y. Arthur S. Bent, president, Bent Brothers, Inc., Los Angeles, Calif. Summer Sollitt, president, Summer Sollitt Company, Chicago, Ill. J. M. Burrows, president, Des Moines Asphalt Paving Company, Des Moines, Iowa.

The text of the letter sent by the officials of six cement companies to Secretary Hoover on April 9 follows:

"In the desire to provide the cement necessary to meet the requirements of this year's unprecedented demand, we call to your attention a condition of uncertainty in the industry due to heavily over-estimated or duplicated contracts for future delivery. If some means of relief can be made effective, the amount of cement available for construction purposes will be materially increased.

"In order that an architect, a contractor or an engineer, may be able to know the exact cost of the cement required for a

A Wisconsin road of concrete construction. One of the many new Federal Aid projects.

A familiar scene on many highways today. In this project an Autocar brings the material to the mixer.

particular enterprise, it is a trade practice to enter into a contract technically known as a "specific job contract,' under the terms of which, the manufacturer agrees to deliver the cement required during the entire construction period of the project at an agreed price. This practice involves the manufacturer in a hazard as to manufacturing cost, because during the life of the contract, the factors entering into cost, may materially advance. The terms of these contracts confine deliveries to the requirements of the job and are so made in order to minimize speculation in cement to the detriment of the public.

"It is a common practice for purchasers —either through excessive caution or desire to speculate at the manufacturer's expense—to make padded contracts naming amounts much in excess of the requirements of the job and even to place duplicate contracts for the requirements of the same job with several different manufacturers. This is the serious problem. It introduces an element of uncertainty into the manufacturer's knowledge of his exact position. Basing his judgment on specific job contracts booked, he figures the amount of his production which is still available for sale. But if the contract for cement has been placed with several companies, only one may be called upon for delivery which means that the other companies have withdrawn from the market the amount of cement for that job, which, if the duplication of contract had not occurred, would be available for sale.

"In the year 1920, an investigation was conducted for the purpose of determining so far as possible, the average amount of cement over-contracted for on specific jobs. Capable engineers were employed to make the estimates. The investigation showed that 40 per cent of the cement so contracted for, was not required for the jobs.

"Demand for building materials this year has aggravated the conditions herewith described, and there is no doubt of an outstanding duplication or padding of contracts running into many millions of barrels that will not be called for delivery, which are now necessarily withheld from the market because of these fictitious contracts. If it was possible to eliminate them, this additional amount of cement would be available for sale, and would be a material influence in making the cement market easier.

"Another factor of importance is the peak load condition which occurs during the months when outdoor construction is most active and the demand for cement heaviest. If consumers would realize that spreading their purchases over the months of normally low demand not only would assure an ample supply but also better delivery, it would be a great help to all concerned. Otherwise the manufacturers are called upon to deliver in the peak months of July, August, September and October more cement than is currently produced or can be currently delivered.

"Realizing that this year would require cement exceeding in amount that of any previous year, cement manufacturers have increased their output beyond that of any in their history, notwithstanding the fact that last year production and shipments exceeded all previous records. For the months of January and February, 1923, the output was 16,789,000 barrels against 8,569,000 for the same months of the previous year, an increase of 8,220,000 barrels, or 95 per cent. At the same time, stocks on hand increased, 2,122,000 barrels having been added in February. Stocks at the end of that month were 14,142,000 barrels. Also stocks of clinker at mills increased over 500,000 barrels.

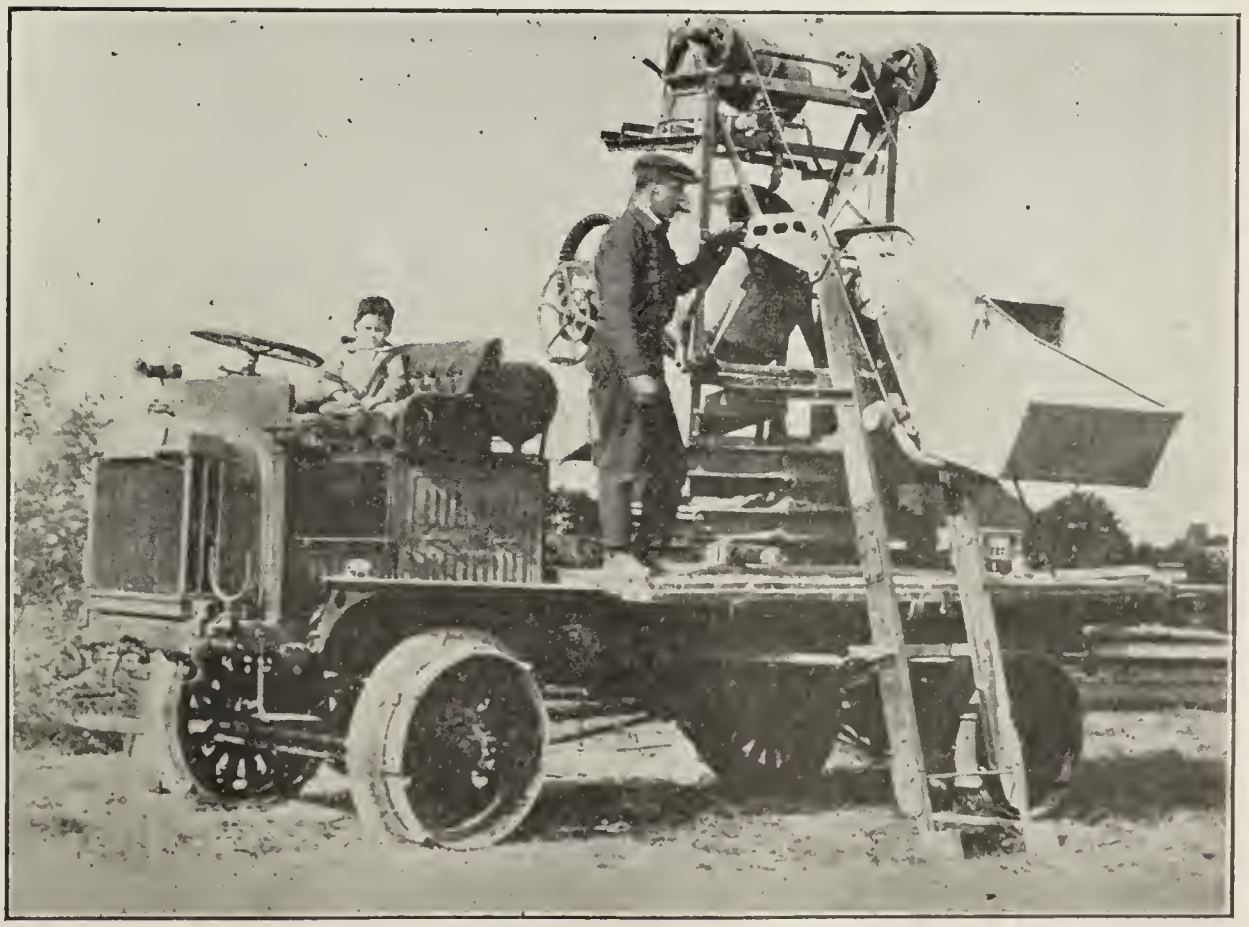
"Conservative estimates indicate that production this year may reach 120,000,000 or 125,000,000 barrels. However, the estimated capacity of the mills of the country, leaves a large margin of excess, and there is no valid reason for assuming that there will be an actual shortage of cement in 1923 if transportation facilities permit of prompt deliveries.

"The peak price for cement was reached in 1920 when the average U. S. Price at the mills for the entire year was $2.02. (Figures from U. S. Geological Survey.) In 1921 the price declined to $1.89, and for the year 1922, there was a still further decline in the average price for all mills of the United States, to $1.76, or a total decline of 26c per barrel.

"In presenting this situation, we are mindful of your great interest in aiding to prevent a cessation of construction and in bringing about a realization on the part of all of those engaged in construction work—whether public or private—that wasteful or selfish methods must be abandoned if the building industry expects to carry to completion all contemplated projects.

"It is our feeling that this brief explanation of our situation and an appreciation by you of its seriousness will suggest the advisability of an appeal to buyers of cement to avoid duplicating contracts and to limit their estimates to their actual needs, and to consumers generally, to spread their buying over the months of light demand.

"We believe that such action would have real weight among those concerned and be of effective benefit to the public generally."



This Long Island contractor transports his mixer from place to place on a powerful Four Wheel Drive truck.

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Effective with this issue the subscription price of CEMENT & ENGINEERING NEWS in United States, Philippine Islands and Mexico will be $2.00 per year. All other countries, $2.50 per year. Single copies 25c. Our present subscribers will be carried through the end of their subscription period at the old rate.

Food for Thought

In another portion of this paper a summary is given of the current road building activity of the several states. Prominent among them is found Minnesota; prominent because it is unique in that if alone, of all states reporting, says "Appropriation exhausted—no work contemplated." Minnesota, seventeenth in the sisterhood of states with a population of 2,387,000; eleventh in area with 84,600 square miles; rated in 1912 as tenth in wealth with an appraised total valuation of over five and one-half billion dollars; she is alone in being broke when it comes to building roads.

In all America there are 2,478,000 miles of public road, of which 299,135 are surfaced, the proportion being one in eight. In Minnesota are 93,517 miles of highway, with only approximately 7,000 miles improved, or a proportion of one in thirteen, or about sixty per cent below the national average. That this great state, was not always thus laggard in this prime public necessity is indicated by the fact that she was by no means slow in availing herself of federal aid, no less than 2,000 miles having been constructed or put under way up until last year on that plan. Something must have occasioned such a sudden reversal of form and perversion of principle.

Looking over the record we find that in 1920 Minnesota was a normal state politically. Up to that time the state thought, voted and was conducted along lines in comparative consonance with the rest of the country, and untried "isms" and theories were interesting in debate rather than in practice. In 1922 something happened, however. One Henrik Shipstead, a so-called Farmer-Labor candidate, was elected to the United States Senate. To a great extent the commonwealth fell, politically, into the hands of the experimentalists—the co-operationists, who would, at one fell sweep, blot out the economic development of the ages and substitute group control of all enterprise.

We are not familiar with Minnesota's financing. Its present plan of government may be sensible and wise, sane and conservative. But it is at least worthy of mention that the only state in the Union which has sent to the national senate a man bearing the radical Farmer-Labor brand should also be the only one which has "no funds available" for road work. We wonder how long it would take such "progressive" political drives to push this nation clear back out of the path of modern advancement into economic *and physical* conditions which existed before the Civil War.

A Two-Sided Story

The discussion regarding duplication of cement and other material orders evoked by correspondence received by Secretary of Commerce Hoover should promote that degree of mutual understanding and confidence which is essential between buyer and seller if industry is to operate at its best.

Whatever may be the reasons or justifications for the policy of over-ordering, it is evident that such a practice is inducive to higher prices. The manufacturer whose experience teaches him that such is the trade practice will base his selling price with this in mind; the practice increases his selling cost and must be figured in on any sale.

The contracting buyer whose experience has taught him that he cannot rely upon a purchase that exactly covers his requirements on a time-limit job, will continue to over-order sufficient material to provide that margin of safety which he must have to prevent possible profit degenerating into actual loss.

Thus we have a two-sided story—a practice which is costly to the cement manufacturer, the contracting builder, and the ultimate consumer. We have the time-honored vicious circle which begins and ends nowhere, but the existence of which is a stumbling-block to better trade conditions. The discussion has opened up a subject that is worthy of careful thought and planning on the part of the industry looking toward the development of a condition which will remove any cause for its existence.

Knowledge Is Power

There is much that is of value to the industry in the plan of the American Construction Council to publish weekly forecasts detailing activities in the building industry. For to inform the public of the demands for various materials is to add one more step in the march of industry toward stability and economical operation.

As the prophet has said, "There is a time and season for everything under the sun," but who, without knowledge, can be certain that his action is in season? With the knowledge of conditions which this forecast will give —knowledge of local as well as of national importance—the prospective builder can tell whether he is adding to an already overburdened industry the problem of speedy erection of some large undertaking, or whether he will be ironing out one of those depressions in industry which is at the same time the bugbear and costly curves of business.

The power that such knowledge of conditions will give can be used wisely to prevent peak loads and slumps—in short, a greater degree of stability will result which will react favorably to all concerned. Just as agriculture is more successfully carried on on the level than in valley and over hill, so industry can operate to better advantage when its load is spread evenly over the year. For this reason, if for no other, the building industry, and those industries that contribute to it, will watch with interest these forecasts from the American Construction Council.

Shall the Government Operate Cement Plants? III

It is a common practice, when things go wrong, to blame the person nearest at hand for the trouble. Thus when the train is late it is the station-master who bears the brunt of public disfavor; when the dinner does not come up to expectation, the guest takes it out on the waiter. Yet, if we take the time and trouble to look for the source of the difficulty that causes our dissatisfaction, and go behind the station-master or waiter we are most likely to find that these two functionaries are entirely blameless and helpless as well, to prevent conditions.

Such is the case with the coal industry today and such it has been since the war period. The public generally has found much fault with conditions in that industry, and their complaints have been, alas, too well justified. But they have complained largely to the retailer from whom they buy their winter's heat, and have failed to go behind the scenes in order to discover the real trouble.

Let us, then, in this discussion relative to government operation of a private industry such as cement, look at the coal industry as it has failed to satisfy us during the past few years, and travel back to the source of the trouble. That trip will lead directly back to the government; the statement is made first, and now we will undertake to carry you over the road to conviction.

It is difficult to say what industry in the country should be placed in the primary position, but it is safe to assert that agriculture, transportation, and coal are the three industries without which this nation could not have reached its present enviable position of wealth and general well-being, and that without them, it would be impossible to maintain that well-being for a single decade. This being true it was natural enough that when the war was thrust upon us, government would feel called upon to control and regulate for the best prosecution of the war those two tangible as well as essential industries, transportation and coal mining.

Having had no experience with coal it was just as natural that the government should make grievous and costly mistakes, for it must be understood that the production of coal is a vastly diversified problem, involving several different methods of mining, great differences in coal quality, and as widely separated costs in production. How a group of men unacquainted with these differences could hope to regulate the industry successfully is beyond understanding; that they failed utterly in the attempt is attested by the lightless nights and heatless days which were presented as a gift to the nation for the first time under government control.

At the outset of government control of coal, an experienced coal man, Francis S. Peabody, was called to Washington and he, in conjunction with the then Secretary of State, Franklin K. Lane, outlined a policy of prices and production which would have provided the abnormal production required by war activities at prices that would have been a burden to none, and have satisfied the producers and distributors of coal. Immediately a hue and cry was set up, Mr. Peabody was sent back to Chicago, and the coal control was turned over to Harry A. Garfield, a college president whose knowledge of coal extended to the ten tons he purchased annually for his home.

Mr. Peabody, having knowledge of the potential capacity of the 6,000 mines already under production, urged that no new properties be opened, but that extra men be put to work in the available operations. He contended that sufficient coal could thus be produced; that railroad equipment could be thus conserved, since available cars would not have added mines to serve; that, since it takes approximately two years to bring a mine to production, time and energy would thus be put to best advantage at a time when time and energy was at a premium.

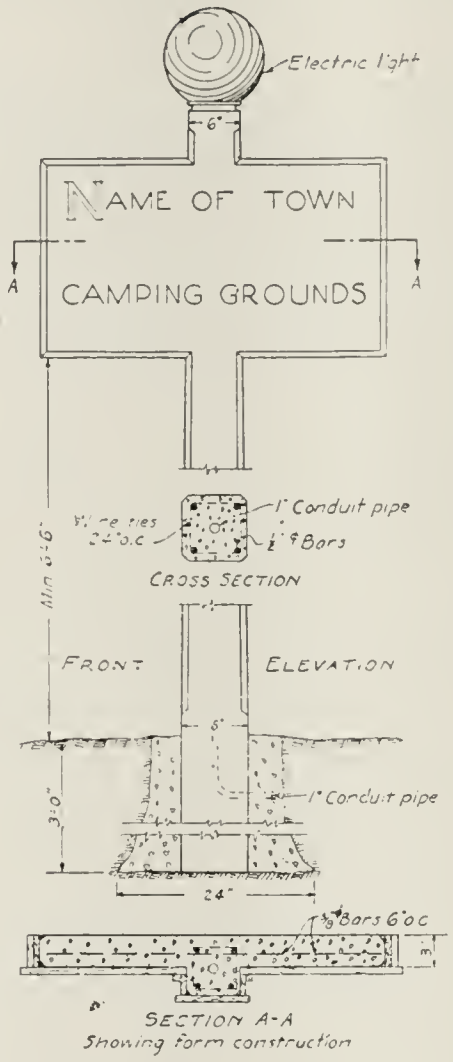
Mr. Garfield reversed this policy, encouraged the development of new mines and consequently left the country at the end of the war with approximately 14,000 mines in operation. Thus the capacity of the nation's coal mines was doubled, the approximate annual capacity of our bituminous mines being today 800,000,000 tons, although the last two years' consumption has not run higher than 400,000,000 tons. To operate these mines it necessitates more than 200,000 miners beyond the number needed to produce the nation's coal requirements and upon the country is saddled not only an unnecessary permanent and frequently idle investment of millions of dollars, but 200,000 miners are idle on pay throughout the year.

Following a policy adopted by the government in connection with the railroad control, miners were encouraged in their attempts to raise wages. It was contended that, since the miner could not expect continuous work, he was entitled to higher than normal pay; it being overlooked that were the nation's coal production balanced by its coal consumption, much of the miners' idle time would disappear, the cost of coal be reduced and the miners' annual income increased.

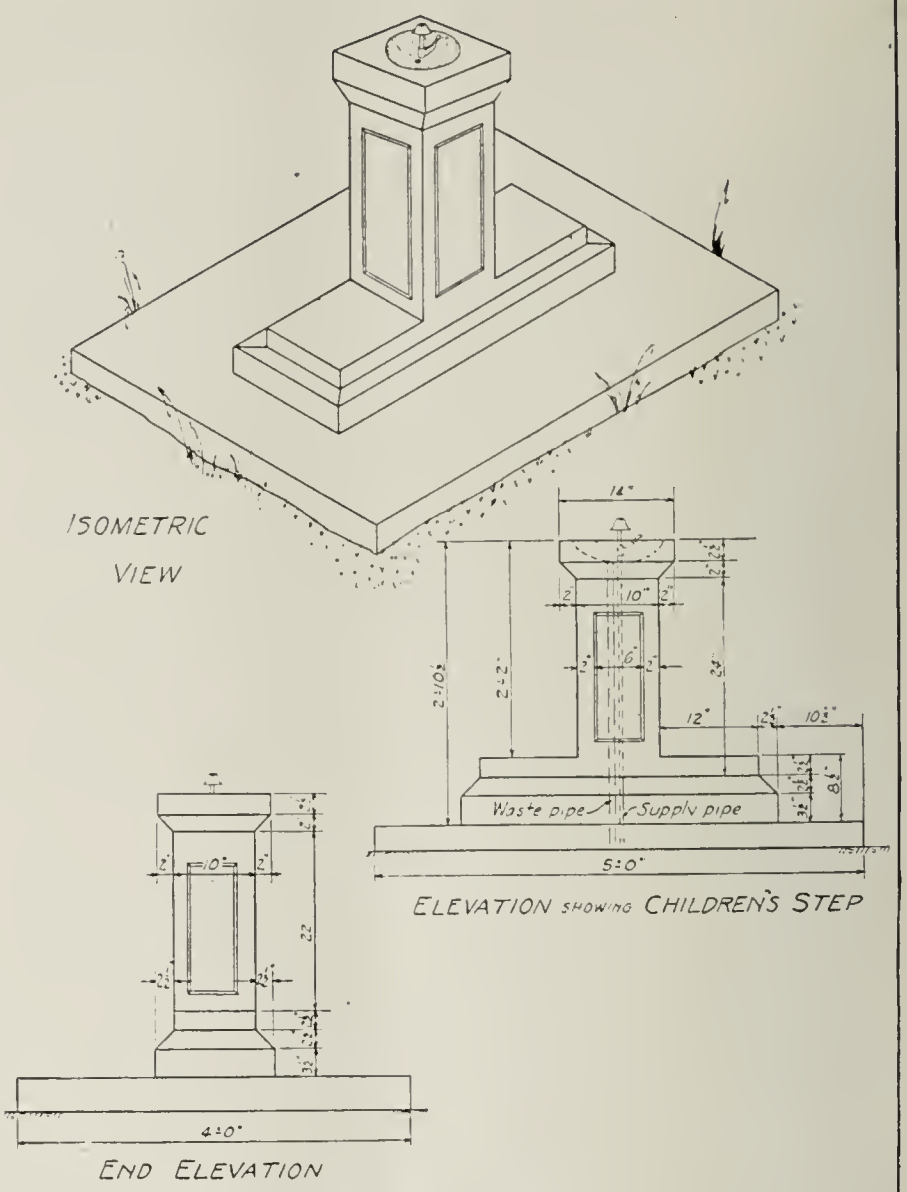
But the results of governmental control of coal did not stop there. By a process of priorities intended to make certain a supply of coal to so-called "essential" industries, the normal channels of distribution were disrupted to an extent which had an inflating effect upon prices and at the same time created artificial coal shortages which were costly in their effect upon operation of the nation's industries. Men who are cold because they cannot get coal to heat their homes, are not as efficient workmen as men who are comfortable.

If it were possible to wipe out the damage which has here been outlined, still the most serious phase of government control of coal could not be escaped. That phase is due to that element in human nature which hates to release power once obtained. To control one of the three basic industries of the nation is to have power, and congress is loath to give up that control. Today a coal commission authorized by the Government is investigating coal with a view to making recommendations this December to Congress, upon which that body so prone to create laws in abundance proposes to legislate further relative to coal.

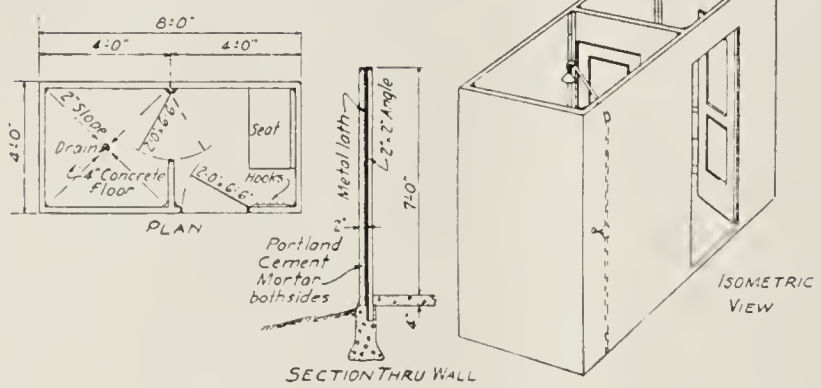
From the standpoint of the public, this control is costly in another way. Since the control has passed from the hands of the owners,—it was the government which forced the settlement of the last coal strike upon a basis which further strengthened the miners in their possession of a wage far out of proportion to the economic wealth they produce—the public has no one to hold responsible for these conditions. The public is at the mercy of demagogues, who, through ignorance, bring about conditions which private control and economic laws would not effect or tolerate.



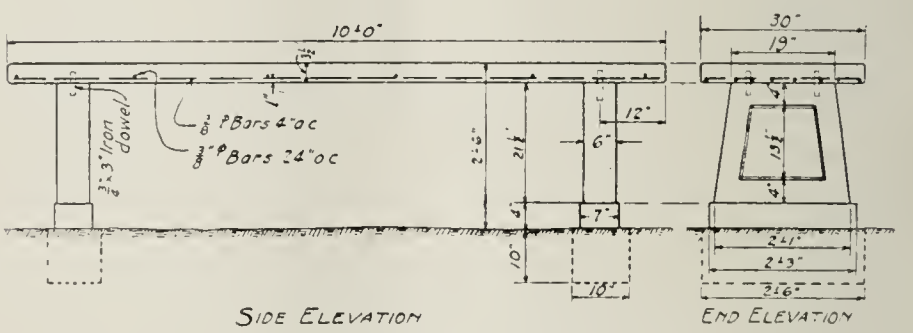
CONCRETE SIGN POST



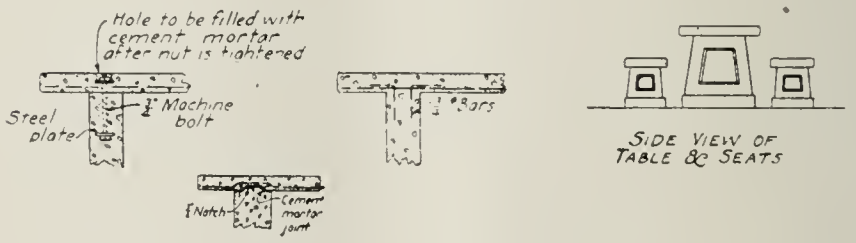
CONCRETE DRINKING FOUNTAIN

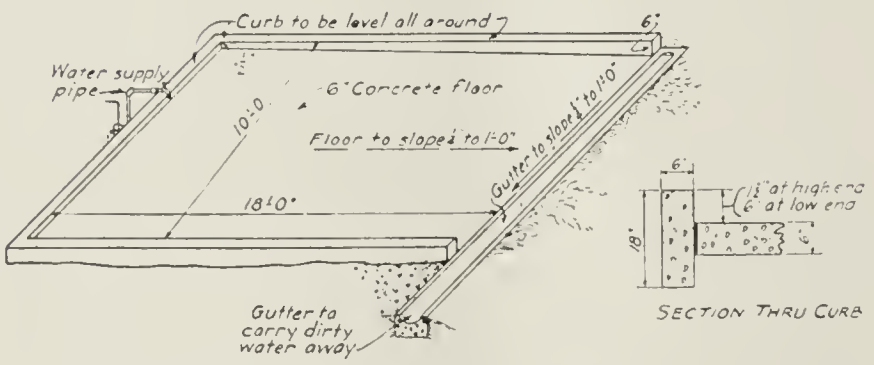


OPEN AIR SHOWER BATH



CONCRETE TABLE

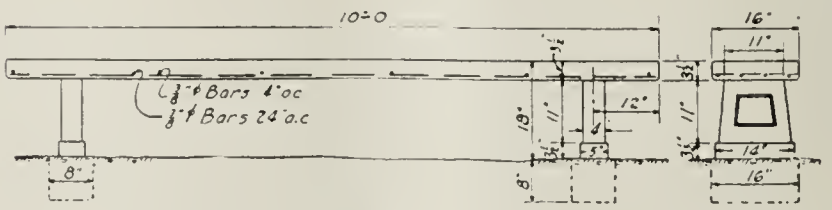

Hole to be filled with cement mortar after nut is tightened
Steel plate
½" Machine bolt
⅜" ϕ Bars
Notch
Cement mortar joint
SIDE VIEW OF TABLE & SEATS



AUTOMOBILE WASHING PLATFORM

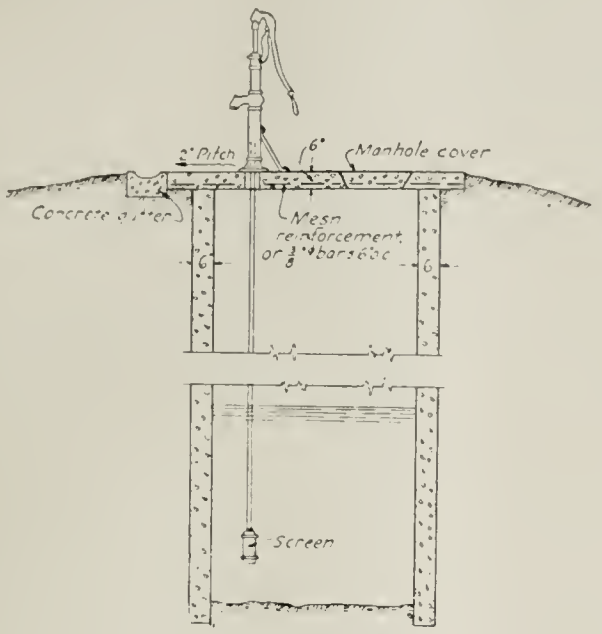
SECTION THRU GUTTER

ALTERNATE ARRANGEMENTS OF FASTENING SLAB TO PEDESTALS

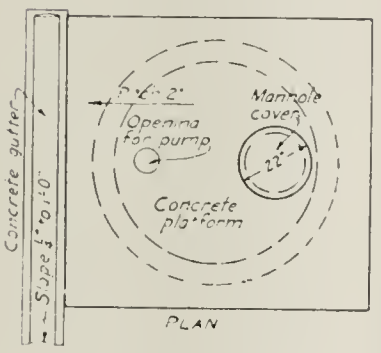


CONCRETE BENCH

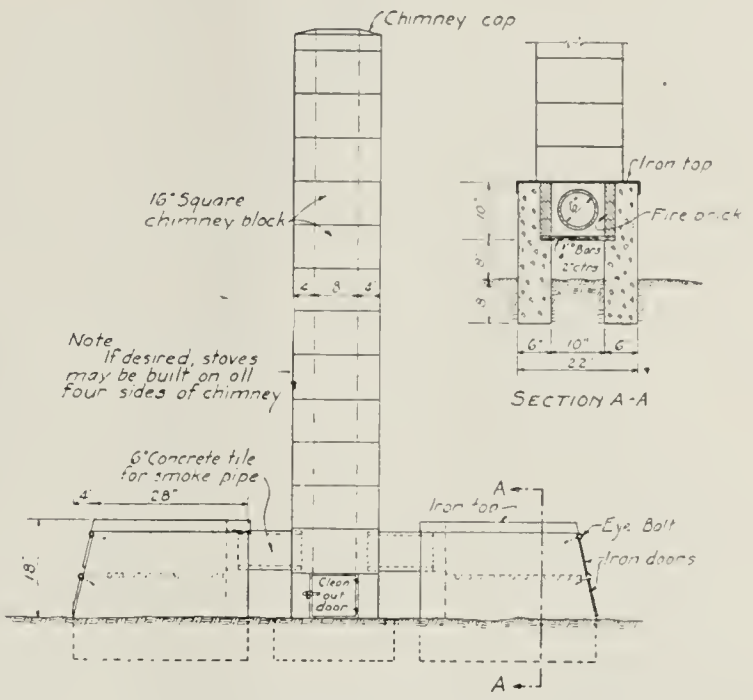
Here are plans for a complete auto-tourist camp — Concrete, indestructible and sanitary



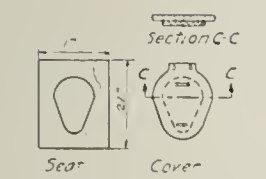
CROSS SECTION



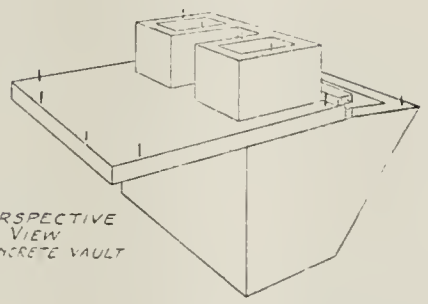
CONCRETE WELL CURB



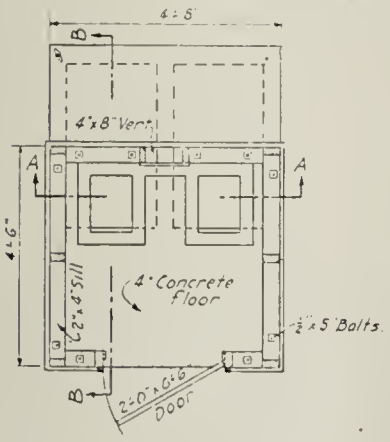
CONCRETE COOK STOVE



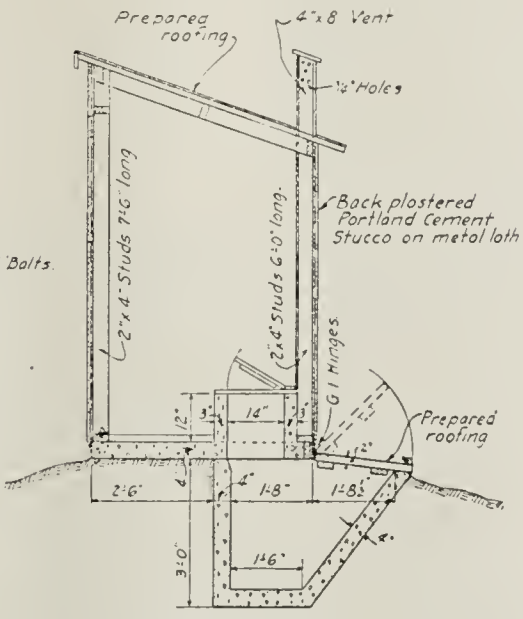
DETAIL OF SEAT & COVER



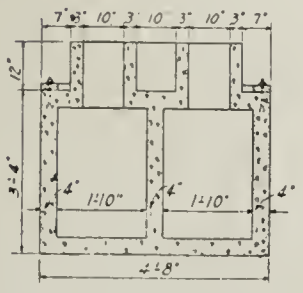
PERSPECTIVE VIEW OF CONCRETE VAULT



FLOOR PLAN

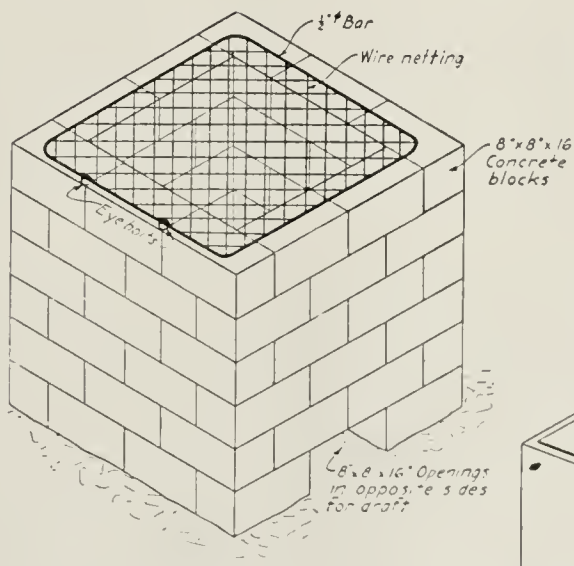


SECTION B-B

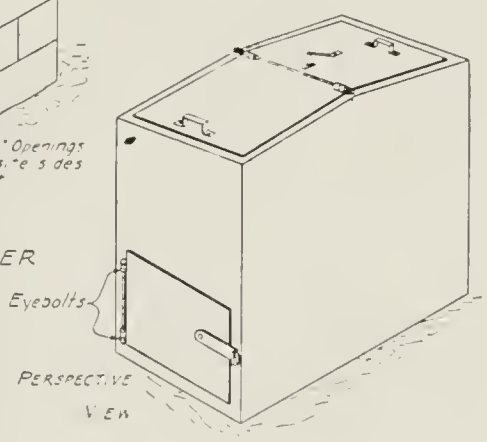


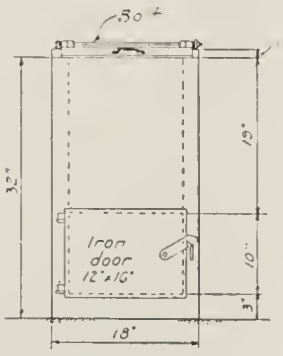
SECTION A-A.

CONCRETE PRIVY VAULT.

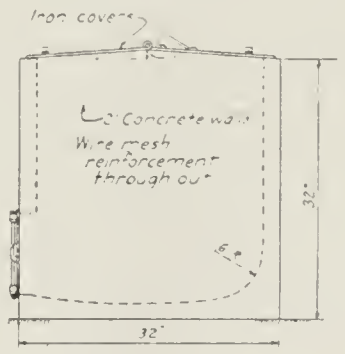


CONCRETE REFUSE BURNER





FRONT ELEVATION



SIDE ELEVATION

CONCRETE GARBAGE CONTAINER

A Mixing Plant Saves Time and Money

An Iowa Contracting Firm Uses a Well Designed Plant Which Partially Solved a Labor Problem

A mast and boom derrick with a clam shell bucket unloads the cars.

No single phase of American industrial progress achieved the high mark established by the concrete road during recent years. Prior to 1909 less than 10,000 square yards of this enduring type of pavement were in use on our public highways. Today more than 20,000 miles have been completed and are carrying millions of tons of commerce from the producing centers to the nation's markets. Actual contracts let to January 1, 1923, call for 23,262 miles. This growth is not the result of "faddism," it is a gradually mounting and ever increasing tribute in public esteem earned by the product which has given them maintenance free, permanent highways that serve from day to day and year to year regardless of weather or traffic impositions. Last year the paving quota devoted to concrete approximated 79,000,000 square yards, divided among streets, alleys and highways—the equivalent of more than 7,000 miles. In 1923 every indication points to greater yardage totals provided contractors are not delayed by bad weather, transportation tie-ups and labor shortages.

Recently the Stephens-Adamson Company of Aurora assisted the Chas. Wetz' & Sons, a contracting firm, in laying out a central concrete mixing plant for the building of seven miles of concrete in an Iowa road building project.

The railroad ran parallel to the road to be improved and there was but one switch track available and that was on the far side of the main line track from the road and at a point about two miles distant from one end of the proposed pavement. The plan was then worked out to use the switch track as it existed and a row of 10 ft. x 10 ft. receiving hoppers was constructed in a temporary way, erecting them at right angles to the track. A mast and boom derrick was located to operate with a clam shell dipper for unloading the cars and depositing a sufficient amount of each size of gravel, crushed stone and sand to fill the hoppers. The balance of the material was deposited on the ground, where it could be reclaimed when desired. Under the hoppers a belt conveyor passed through the cement house and the two main line tracks. This conveyor extended to a point about 200 feet away, where the conveyor was high enough to deliver its load into a hopper set over the concrete mixer. The mixer elevated sufficiently to deliver mixed concrete to auto trucks carrying dump hoppers of from one to one and one-half yards capacity.

Between the bottom of the receiving hoppers and the belt conveyor, were erected measuring hoppers which were made adjustable. This adjustment was changed to permit of proportioning the sand, gravel and crushed stone required to make the specification concrete. These measuring hoppers were made with two gates, one a sliding gate at the top which was operated by a rack and pinion and chain wheel with the chain looped down to be convenient for the operator. The other gate was a Duplex gate placed at the lower end of the measuring hopper. This gate was closed and the upper one was opened until the hopper was full, then the upper gate was shut. When all the hoppers were full and the belt conveyor was running, at a bell signal the attendant would open each gate so that the material would flow onto the belt in layers. As this material passed under the cement house a charge of cement was dropped onto the material on the belt. This charge ran to the receiving hopper above the mixer. When the previous charge in the mixer was discharged, a new charge was drawn into the mixer and the operation was complete. It was possible to furnish material just as fast as the mixer would take it.

The accurate measuring of each of the ingredients and the dry mixing which took place by the conveying of the materials and discharging into the hopper over the mixing was largely responsible for the excellent concrete placed on the job.

The longest haul for mixed concrete was five and one-fourth miles and this was accomplished before the initial set started and met the entire approval of all interested officials.

On big contracts where large concrete construction work requires the placement of quantities of concrete, there is a definite need for labor saving material handling machinery. In certain instances the savings incurred are more than sufficient to defray the expense of the installation for the one contract, regardless of the saving in time and regardless of the value of the slightly used machinery which is available for other succeeding work.—*Labor Saver.*

The conveyor is high enough to deliver its load into a hopper over the mixer.

Pulverized Coal in the Cement Industry

Many Unusual Features Found in Modern Coal Grinding and Handling Equipment — Cement Industry the Fourth Largest User of Coal

By George S. Eaton

Few industries are so dependent upon a large and steady supply of fuel as is the portland cement industry, which is the fourth largest manufacturing consumer of coal. Oil and gas are also employed in cement mills, but coal is the fuel most used. Not only is a steady supply of fuel essential if the plants are to turn out cement, but in the case of coal, the major part of it must be reduced to a powder as fine as flour before it can be burned. Producing and using this powdered coal requires a wide variety of unusual and interesting equipment, which has been the subject of much study and consequent improvement.

One of the many unexpected things that a visitor finds in a portland cement plant is the number of cars of coal awaiting unloading. The importance of fuel to the cement industry becomes apparent when the plant superintendent explains that for every two cars of cement shipped out one car of coal must be brought in.

In a cement plant there are two principal uses of fuel—in the kilns for burning the raw materials into cement clinker, and in the power houses for generating the great amount of power needed to operate the vast quantity of heavy equipment. Fuel is also required for driving off moisture from the raw materials before they are ground and even for drying the coal itself before it is pulverized.

Where available, fuel oil or gas can be employed in place of coal, but the use of these fuels is confined to certain areas in the west and southwest. Out of the operating cement plants reporting to the U. S. Geological Survey in 1921 (the latest figures published) a heavy percentage burned only powdered coal and a few employed coal in part. With the exception of one plant, which utilized natural gas, all of the remaining plants burned oil.

Over 8,500,000 tons of coal were burned last year in making the country's cement, it is estimated. Of this tonnage, approximately 5,800,000 tons were reduced to an extremely fine powder for use in the great rotary kilns now employed in burning the raw materials into the clinker from which cement is made. These are huge steel cylinders set at a slight inclination to the horizontal.

Until about thirty years ago, all portland cement was burned in stationary vertical kilns. A number of improvements had been made over the earliest type so that the operation of cement making was continuous. Nevertheless the output obtained was comparatively small—perhaps 100 barrels a day per kiln—and the labor involved great. Following a number of experiments carried on abroad and in this country, soon after 1890, the forerunner of the present day rotary kiln was successfully placed in operation in the United States.

Rotary Kiln Brings Fuel Change

The introduction of the rotary kiln necessarily brought a change from the coke used in the vertical kilns to a fuel that could be blown into the revolving cylinder to produce instantaneously the intense temperature needed for clinkering the raw materials. In the vertical kiln, any particular part of the charge remained in the kiln for two or three days, whereas even in the largest modern rotary, the time in the kiln is only two or three hours.

In this country crude petroleum was first used as rotary kiln fuel, barring some experiments with producer gas, but in 1897 powdered coal was introduced and soon became the usual fuel. The success obtained with this fuel in the new type kilns was such that this means of burning clinker was soon adopted throughout the industry.

But the adoption of the rotary kiln was of course only the first step in the development of present day burning practice. The first kilns in this country were only forty feet long. It was soon found more economical to lengthen them and in 1900 a "modern kiln" was sixty feet long by six or seven feet in diameter. Ten years later the range in length was from sixty to 150 feet, with 125 feet as standard in the newer plants. At the present time, the maximum length is 240 feet and the maximum diameter twelve feet. One of the largest kilns today has about fifteen times the volume of the sixty by six foot kiln considered large in 1900, and about ten times its output.

Providing fuel for these present day giants has necessitated similar developments in the equipment for pulverizing and handling coal. But all the effort required has been well worth while, for without these great advances in manufacturing methods and equipment, present day outputs and present day prices would be impossible. During the thirty years or so since the introduction of the rotary kiln for cement burning, output has climbed from around half a million barrels a year to the 115,000,000 barrels produced in 1922.

Pulverized coal is merely coal that has been crushed, dried and pulverized until it contains a very high percentage of impalpable powder. For use in burning cement clinker, a product fine enough so that eighty-five per cent will pass a sieve made with 200 wires each way to the inch is considered good. This means that over five-sixths of the products will shake through a screen having 40,000 holes to the square inch—a fabric made from bronze wire but woven finer than silk.

Why Pulverize Coal?

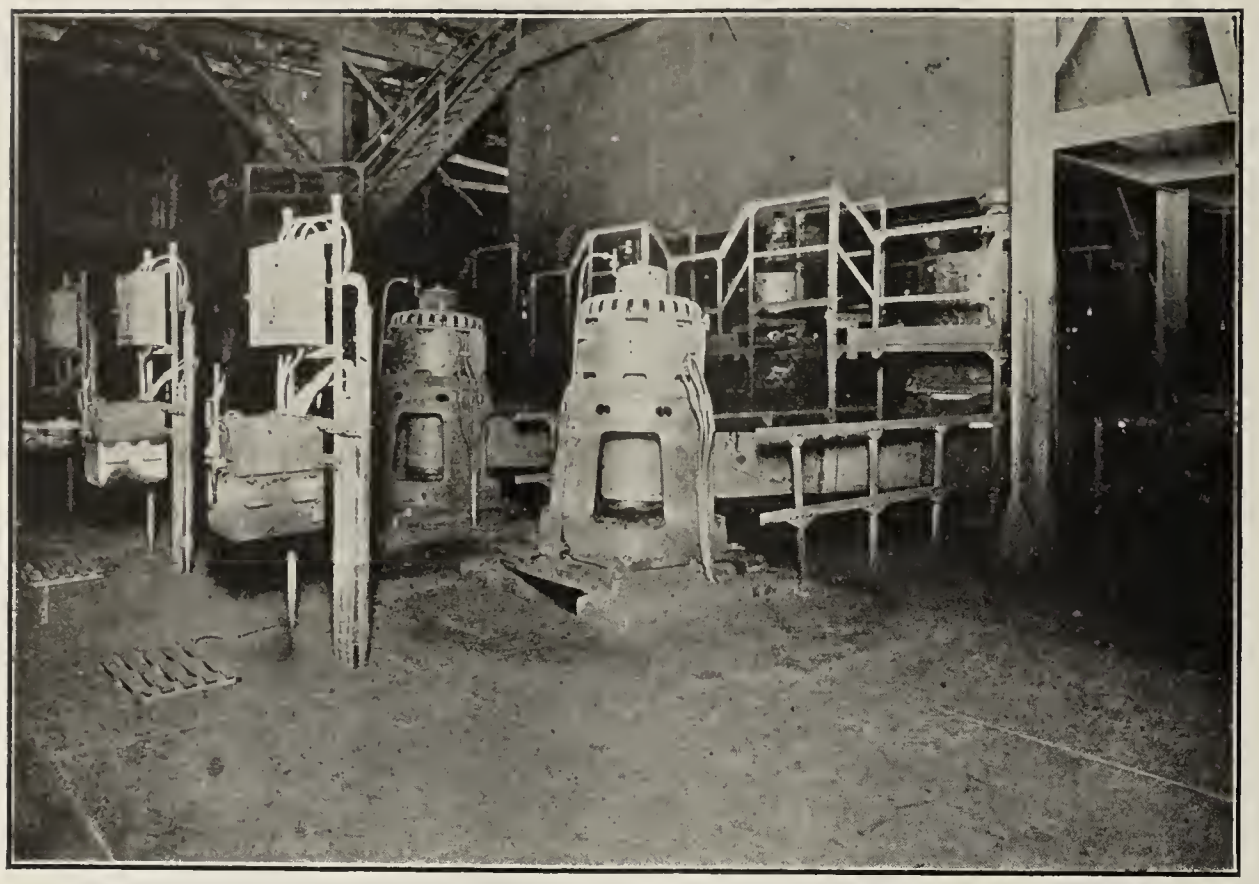
In order that coal may burn, oxygen must be supplied to combine with the combustible ingredients. The only place of contact is on the surface of each piece of coal. An increase in this area means greater speed of combustion; dividing a lump of coal into a number of smaller pieces greatly increases the surface area. If the lump is reduced to powder, this area has been multiplied hundreds of times.

By pulverizing the coal very finely and blowing it into the kiln or furnace in a sort of spray, the manufacturer can provide each tiny particle with air enough so that complete combustion is assured. There is no longer unconsumed carbon in the ash and there need not be a large volume of excess air to lower the resulting temperature. This explains one of the great advantages of pulverized coal for use either in heating power plant boilers or in cement kilns. It is in effect a "mechanical gas" and burns much like fuel oil or natural gas.

In burning cement, an intense heat is essential in order that the necessary physical and chemical changes may take place. A temperature of from 2,500 to 3,000 degrees Fahrenheit is required in the lower part of the kiln, which must be well lined with fire brick to keep the steel shell from melting. Powdered coal will furnish the necessary intense heat.

Aside from the high temperature attainable and the efficiency of a pulverized coal flame, the ease of control is another major advantage. As with oil or gas, the supply of fuel may be increased or diminished instantly as occasion requires. Then, because of the complete combustion, smoke

A sample of the coal is taken to determine its heating value and moisture content before it is used in a cement plant.



These mills grind the coal for use in the huge kilns.

is practically eliminated. Conveying problems are simplified because the material can be introduced by means of air under pressure. All these advantages go far to explain why at the present time the use of powdered coal is spreading beyond the cement industry, long its only important user, into other fields such as heating metal working furnaces and power plant boilers.

Coal for Cement Burning

While one of the big advantages of pulverized coal for power plant use lies in the fact that poor grades of coal can be successfully burned when powdered, other requirements so govern the selection of fuel for cement burning that a high grade coal is ordinarily utilized. Where obtainable, cement companies ordinarily prefer a good grade of gas slack containing thirty to forty-five per cent of volatile matter and fifty to sixty per cent of fixed carbon. Sulphur content should be reasonably low, and preferably the coal should not contain more than five to ten per cent of ash. Of course, as low a moisture content as possible is desired, for moisture must be driven off in dryers before the coal is pulverized. Good practice will allow only about one per cent of moisture when the coal is fired.

Coals that are too high in fixed carbon are difficult to ignite, and the resulting flame will not carry far enough into the kiln; on the other hand, fuel too low in fixed carbon will not furnish enough heat for best results. Several experiments have been made to determine the practicability of burning anthracite silt and coke breeze in cement kilns. In using a mixture of bituminous coal and anthracite, it has been found that fair results can be obtained in case the percentage of anthracite does not go over thirty. Coke breeze and various low grade coals have been successfully used in power plant furnaces when powdered, but for cement making where it is possible to secure a high grade coal, the manufacturers have found it more economical in the end to use that.

Pulverized Coal for Power Plants

A number of years ago, after pulverized coal had become established as a kiln fuel, the cement manufacturers experimented with it in their power plants. Because the apparatus then available was not suited to this new form of fuel, the results were disappointing. More urgent matters soon demanded their attention, so that until a short time ago none of their power plants burned pulverized coal. Within the last few years, however, there has been a remarkable development in the utilization of powdered coal in power plant operation, and several cement companies have adopted this fuel in firing the boilers. Its use would doubtless spread were it not for the fact that a plan giving much greater economy in power production has been developed. This is the use of the waste gases, which emerge from the kiln at temperatures ranging from 900 to 1500 degrees Fahrenheit, for heating power plant boilers. A considerable number of plants already have adopted this means of conserving fuel and others will doubtless follow. A very heavy initial expenditure is necessary, however, in following out this plan so that some time will be required for its general adoption.

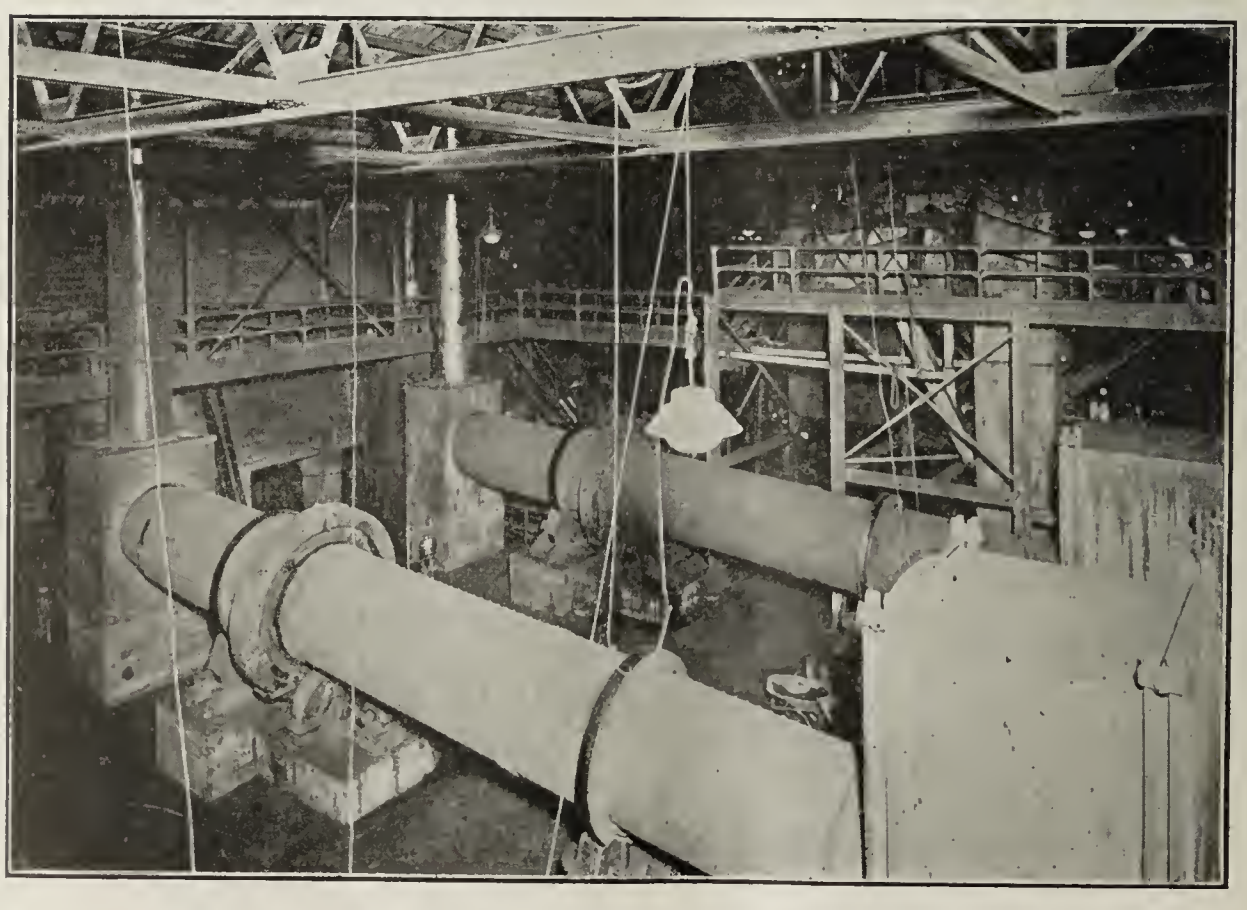
Power requirements in the cement industry are high. Figures given in the 1919 U. S. census reports (the latest available) show that out of the 350 manufacturing classifications there listed, only two required more power per dollar's worth of output than did the portland cement industry. About twenty horsepower hours are required in making a single barrel of cement. To supply one of the largest cement plants, a power house would be needed that is large enough to serve a city of 150,000 people, lighting its streets, operating a number of factories, and serving the domestic consumers with light and with power for household appliances.

Process of Manufacture

The chief power consumption in a cement plant lies in the eight crushing and grinding operations that are a part of the manufacturing processes. As the raw materials are blasted loose in the quarries, they must be reduced from the large pieces picked up by the steam shovel—many of them weighing a ton or more—to fragments four to six inches in diameter, then into smaller pieces, next into particles as big as sand grains, and finally into a powder finer than flour. The coal for burning must be pulverized to equal fineness. Carefully proportioned and thoroughly mixed, the raw materials then go to the kilns through which they slowly travel as the kiln rotates. In the upper end of the kiln the moisture is driven off. As the mixture reaches a zone of higher temperature, the carbon dioxide is given up. Finally in the clinkering zone, where the coal burns in a great tongue of flame thirty feet long, the tiny particles form new physical and chemical compounds and emerge in the form of clinker—glass-hard balls ranging in size from small marbles to walnuts.

After it is cooled, this clinker must now be reduced to powder. Before the clinker is pulverized, a small quantity of gypsum is added in order to keep the resulting cement from hardening too rapidly. When the clinker and the added gypsum are pulverized into a powder so fine that at least seventy-eight per cent will pass through the 200 mesh sieve—a sieve that will hold water—the product is portland cement.

In addition to the operation of all this



After it is ground the coal is dried in these immense driers.

crushing and grinding equipment and of the kilns, power is required for operating a great variety of conveying equipment and for running the packing machines by which cement is put in bags ready for shipment.

Coal Pulverizing Machinery

During the many years that pulverized coal has been in use in the cement industry, a considerable variety of crushing and pulverizing equipment has been developed. Other apparatus required by the use of this fuel includes driers, conveyors of various sorts, bins, fans, air compressors, feeders and burners.

Since the coal must be finely ground before use, the cement companies usually buy slack. In case this contains no particles over one-half or three-quarters of an inch in diameter, it can go directly to most types of pulverizing mills. If for some reason mine run is used, then the usual practice is to provide some sort of small crusher to break up the lumps. In case the lumps are small, what is known as a hammer mill is very often employed to prepare the material for the pulverizing equipment.

While various types of preliminary reducing equipment are serviceable, the toothed-roll type of crusher and the hammer mill seem to be preferred. The crusher may have either one of two rolls. Especially for use with large lumps, it is often equipped with heavy knobs or teeth that project beyond the corrugations on the roll face, in order to fracture the large lumps of coal and to draw them into the crushing zone.

For the actual pulverizing, some sort of centrifugal mill is very often employed. In other cases, the well known tube mill or some modification of it, is utilized. One company makes a mill of this type that has two compartments—one corresponding to the ball mill, frequently used for preliminary grinding in the case of raw materials or clinker, and the second to the tube mill, in which the final grinding is accomplished.

Operating Principles

In each case, the grinding is accomplished by the action of several tons of steel balls that are carried up the sides of the cylinder as the mill revolves, and then are thrown out and down upon the material to be pulverized. Specially shaped balls are sometimes used. Another company manufactures mills, also using balls or flint pebbles, that are conical in shape instead of being of the usual cylindrical type.

The pulverized coal is blown through the pipe at the left of the illustration showing its entrance into the rotary kilns.

The principle of the centrifugal mill is simple. When a boy swings a bucket of water around and around above his head, the water is held in the bucket by centrifugal force. In the centrifugal mill, because of this same force, rollers or heavy balls press against a die or fixed ring as they are rotated rapidly. The pressure grinds up the material caught between the moving rollers or balls and the fixed die. In at least one machine of this type, ploughs are set just in front of each roller to throw a constant stream of material between it and the fixed grinding ring.

In the hammer mills, much used in preparing material for pulverizers, revolving hammers disintegrate the coal by impact. These hammers strike the pieces as they are fed in, knocking them against stationary breaker plates where most of the crushing and grinding is done. One or two makes of impact machines are designed to perform the pulverization itself rather than merely the preliminary grinding.

By adjusting the position of the hammers, different sizes of products can be secured. The centrifugal mills also can be adjusted to give the fineness desired, while the output of mills using a charge of balls can be controlled by varying the charge and speed of rotation.

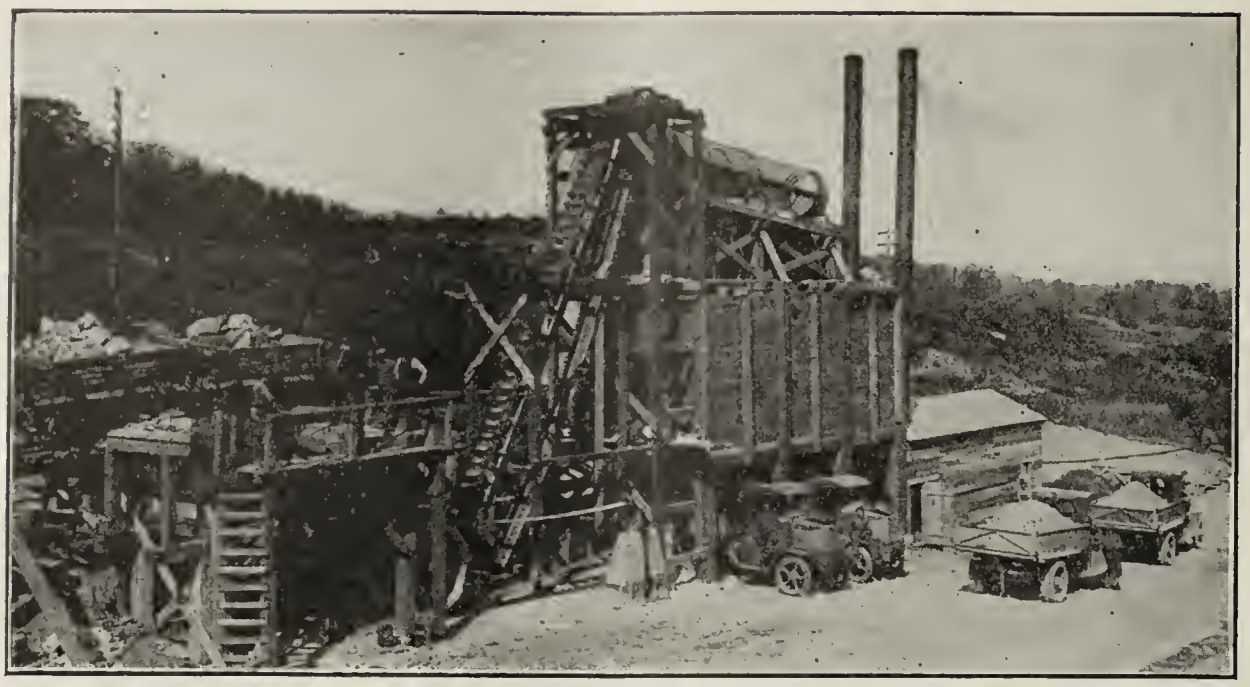
Several manufacturers now employ air separators in connection with pulverizing equipment in order to remove the fine particles as fast as produced. By this plan, the dust is taken away, eliminating the cushioning action and increasing the machine's efficiency as a pulverizer. Material too coarse to be carried by the current of air induced by the exhaust fan remains behind for further pulverization. The fine particles are precipitated in a device known as a collector, in which the velocity of the air current is reduced and its direction of travel changed repeatedly.

Many considerations enter into the selection of coal grinding and pulverizing equipment. In some plants, power consumption is of prime importance while in others it is not so vital as other factors. Uninterrupted service may be the governing consideration. Again, low cost of repairs and ease of maintenance may lead to the adoption of a particular piece of equipment. A wide variety of tried apparatus is now on the market. Needless to say, pulverizing coal adds considerably to the expense for fuel; including all proper charges, the cost may reach a dollar a ton.

Another view of the feed pipes through which the powdered fuel is blown. The kiln is at the right.

Drying the Coal

In order to reduce the moisture in the coal to one per cent or so, coal must be put through driers. As received, especially during winter, it may contain as much as fifteen per cent of moisture, although much less than that is customary in regions where high grade coals can be secured. Coal is dried after any necessary crushing has been done in most cases, and always



A stone crushing unit installed by the Good Roads Machinery Company of Kennett Square, Pa. Note the method of loading heavy motor trucks.

before pulverization. For power plant use, coal is sometimes powdered without being dried.

Various forms of driers are in satisfactory service. The rotary types are commonly used. One of the simplest of these consists of a long revolving cylinder that passes through a brick housing containing the furnace. Contact with the cylinder cools the gases sufficiently so that they can safely be led back by a flue to the lower end of the slightly inclined cylinder, and allowed to pass up over the coal being dried. The latter is admitted at the upper end of the drier.

In most recent types of driers, the double shell principle is usually employed. The shell is either enclosed in a brick housing which contains the combustion chamber, or is connected with a brick furnace at the end. Usually the hot gases pass from the combustion chamber, which is near the upper end of the drier, around the inner shell containing the coal to be dried, and then enter the lower end of the inner cylinder. With the aid of an exhauster fan, they are drawn back over and through the tumbling coal to the dust collector and stack.

By this plan the temperature of the hot gases is sufficiently reduced before they come in contact with the coal so that its volatile content is not driven off, and so that there is no danger of the flames coming in contact with the coal being dried. In addition, this plan reduces radiation losses. Pulverized coal is sometimes utilized in firing this type of drier; its use in driers for raw materials is rapidly becoming general practice.

One of the double shell driers operates on a slightly different plan. In this, the combustion chamber is located at the upper end of the drier, and the inner cylinder extends into the brick furnace. Coal is fed into the upper end of the drier between the two shells. By means of flights or lifters on the inside of the outer shell, the coal is repeatedly dropped upon the hot inner one, through which the hot gases are passing. These gases also are drawn back between the two shells to the exhaust, continuing the drying action.

Coal Conveying Equipment

For conveying the pulverized coal from the machines to storage bins, and from there to the point of use, whether it be the driers or the kilns, air tight apparatus is essential. Bucket elevators have been generally used for elevating the coal, and screw conveyors for horizontal movement. Recently a new system has been developed that promises much. In brief, this consists of a short screw that serves as a material pump, forcing coal into a pipe transport line. At the point where the pulverized material is discharged from the pump barrel, compressed air is introduced. This mixes with the coal, making it fluid enough to flow through the pipe. An air pressure of from fifteen to thirty pounds is required, depending upon the length of line and the lift. As the amount of air introduced is far too little to support combustion, there is no danger from fire. The coal passes through the pipe line to its destination. Through the use of suitable valves, it can be deposited in any one of a number of bins. The apparatus has been installed to carry coal 1,000 feet or more horizontally, and to lift it as much as sixty-five feet.

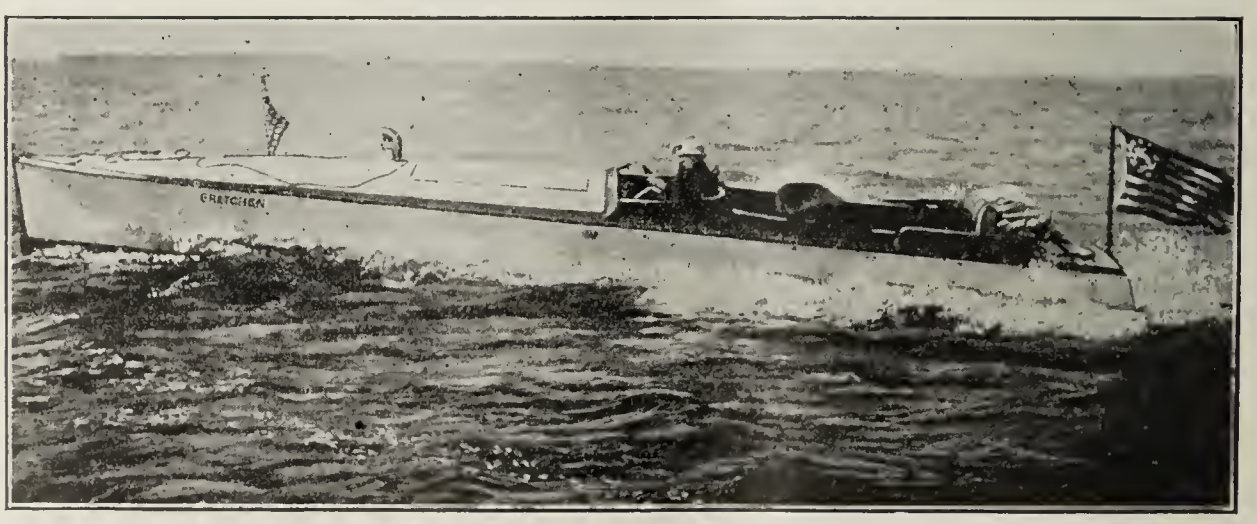
For feeding the kiln, special apparatus is provided. Usually a screw conveyor moves the coal from the bin to a mixing chamber where air under pressure is introduced. Often the pressure is only a few ounces, produced by a fan. Other plants use air at high pressure—from sixty to eighty pounds—in which case only about ten per cent of the total air needed for combustion is provided under pressure, as the principal object is to carry the charge of coal well into the kiln. With low pressure air, from twenty to thirty per cent is introduced with the coal. The remainder of the air required enters through openings around the hood and through the clinker discharge area at the end of the kiln.

Safe Handling Methods

Under certain conditions, almost any dust containing combustible material—whether coal, grain, or flour—is dangerous. Coal dust mixed with the proper proportion of air is highly explosive. For this reason, proper care in handling it is of the utmost importance. But when the hazards are fully recognized, as they are in the cement industry today, it can be and is handled with safety. The practice developed in the cement industry is of much value to the companies in other fields that are now adopting pulverized coal for heating power plant boilers.

The more important of these precautions are as follows: The coal buildings should be clean, well lighted and well ventilated, so that there is good circulation of air. Coal dust must not be allowed to settle, for in that case if disturbed, an explosive dust cloud might result. Under no conditions should naked lights be allowed. The coal driers should be separated from the grinding equipment by at least a fire wall. All conveyors must be tight enough to prevent the escape of dust. Magnetic separators should be installed to remove all iron from the incoming coal, in order to avoid sparks in the grinding equipment. And employees must be careful.

Next to the portland cement industry, the biggest users of pulverized coal are the iron and steel mills, and the copper producers. The plan of utilizing this fuel for generating power is growing rapidly, however, and recently a number of large public utility companies and also several industrial corporations have installed the necessary equipment in their power plants. Among the more notable of these are the Lakeside Station of the Milwauke Electric Railway and Light Company; the Cahokia plant of the Union Electric & Power Company, E. St. Louis; Puget Sound Traction, Light & Power Company, Seattle; Ford Motor Company, River Rouge Plant, Detroit; Eline's, Inc., Milwaukee; and the Rochester Gas & Electric Corporation, Rochester, N. Y.



C. H. McNider, president of the Northwestern States Portland Cement Company of Mason City, Iowa, one of the most prominent figures in the cement industry as well as in the world of finance, is a great lover of outdoor sports. He is especially fond of the water and is shown in the fastest boat on his favorite lake—Clear Lake, Iowa. In the seat beside him is his son, Colonel Hanford McNider, past national commander of The American Legion and a possible candidate for vice-president in 1924.

The McNiders in their speed boat "The Gretchen" can cover a mile at the rate of "40 miles per" according to McNider, senior, and a great portion of their time is spent out over the clear, cool waters of beautiful Clear Lake. The Gretchen is the fastest boat on the lake, has 150 horsepower and is capable of going forty miles per hour.

Points to Watch in Water Tank Construction

Whenever you find a concrete watering tank that leaks, is cracked or has burst on account of ice, it is pretty certain that there has been some mistake made in the method of construction. While there is nothing difficult about building a watering tank yet there are a number of points to keep in mind to get the best results.

Probably more failures are due to improper or insufficient reinforcement than to any other cause. All concrete tanks and troughs should always be reinforced. By reinforcement is meant the placing of steel rods or wire mesh in the tank walls and floor in such a manner that their strength will be increased. Reinforcement tends to prevent the formation of cracks which might result from unequal settlement of the base or might be caused by the pressure of ice when water freezes.

For small stock watering tanks quarter inch rods, either round or square, makes very satisfactory reinforcement. Number 3 wires have approximately the same strength as quarter inch round rods and may be used instead. Woven wire fencing is also suitable. The cut away section of the drawing shows the proper location of rods in watering tanks of ordinary size. The horizontal rods are located six inches above one another and extend entirely around the tank walls. If one rod is not long enough to go all the way around two or more rods may be hooked together or the ends of the rods may be lapped about 18 inches and then wired together. In the floor there are two sets of rods, one set running lengthwise and the other set crosswise of the tank. These have both ends bent at right angles to extend up in the tank walls.

If woven wire fencing is used it should have pieces laid across the floor in both directions and extend up in the wall in a similar manner. Likewise, there should be a strip extending entirely around the wall. The proper location for the reinforcement is in the center of the wall.

Form construction is another important item. It should be remembered that concrete molds itself to the shape of the forms and that the concrete surfaces will not be any smoother than the form forces and any cracks or rough spots on the form boards will show up on the finished concrete. Boards having the sides planed that come in contact with the concrete mixture are preferable. Use only sound straight lumber for the forms and the construction should be rigid enough to prevent bulging of the boards when concrete is deposited or spaded. One inch boards are satisfactory for the form faces if the braces are located not more than two feet apart. If two inch boards are used the braces may be as much as five feet apart.

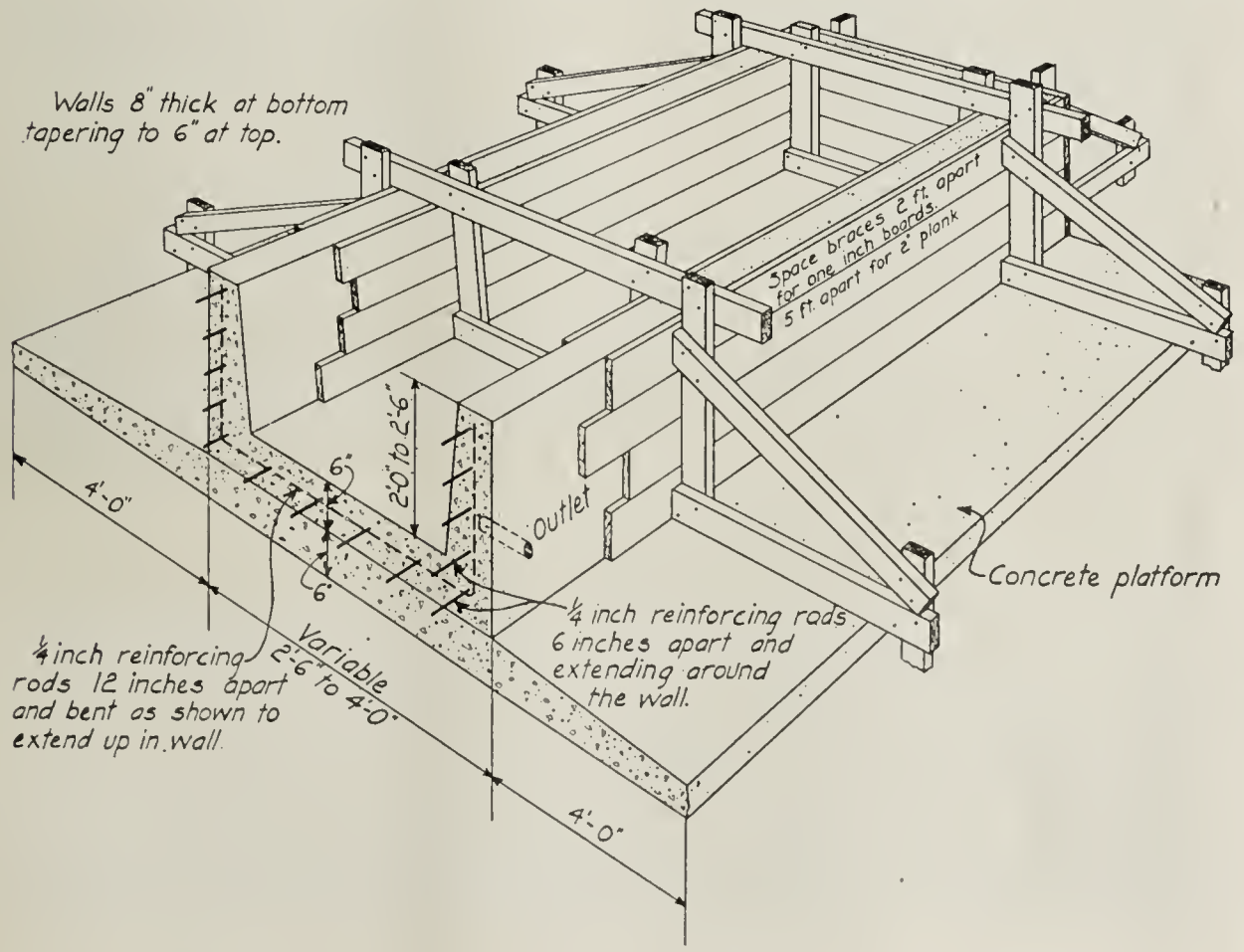
It is a good scheme to oil the form faces on the sides next to the concrete to prevent concrete from sticking to them and to prevent the moisture in the mixture from causing the boards to warp. Crude oil, machine oil or oil from the automobile crank case is suitable for this purpose. If care is exercised in building the forms and removing them one set can be used over and over again.

A concrete platform for the tank to rest on is a good investment. It prevents settlement of the tank and if extended four feet on each side provides a clean, dry place for the live stock to stand when drinking. The mud hole so frequently found alongside watering tanks is eliminated. Concrete for the platform may be mixed in the proportion of one part cement, two parts sand and four parts pebbles or crushed rock. It is always a good scheme to screen gravel through a screen having openings a quarter inch square. The fine material passing through such a screen is known among concrete men as sand and the material too coarse to go through is called pebbles. By separating the sand and pebbles more accurate proportions are obtained which is essential to secure density and strength. With this mixture one bag of cement will build a square foot of platform 6 inches thick. Cement, sand and pebbles should be mixed together until they are all evenly distributed throughout the mixture. Then add only enough clean water to produce quaky concrete.

Forms for the platform may consist of one by six boards set on edge and held in place by stakes driven in the ground at three foot intervals. The surface of the platform should be finished with a wood float which produces a smooth surface, yet have it slightly gritty. It will then not become slippery. After concrete in the platform has been permitted to harden for several days work may be started on the tank itself. First the outside form is erected in the proper place and carefully braced. Then the reinforcement for the walls and floor is placed after which the inside form is put in position. Inside and outside forms are held proper distance apart by means of spreaders and wire ties.

For the tank a slightly richer mixture, say one part cement, two of sand and three of pebbles is recommended to make sure that the concrete will be dense and watertight. The floor of the tank is placed first and care being taken to see that the concrete is worked around the reinforcement. The wall is placed immediately thereafter

A concrete water tank built as per the plan at the bottom when completed. Note the platform of cement in front of the tank preventing the mud hole so frequent at watering places.


Walls 8" thick at bottom tapering to 6" at top.
Space braces 2 ft. apart for one inch boards. 5 ft. apart for 2" plank
2'0" to 2'6"
6"
4'-0"
Outlet
Concrete platform
¼ inch reinforcing rods 6 inches apart and extending around the wall.
¼ inch reinforcing rods 12 inches apart and bent as shown to extend up in wall.
6"
Variable 2'6" to 4'-0"
4'-0"

The plan for the water tank as shown in the illustration above.

so as not to form a joint at the floor level. As concrete is dropped in the forms it is spaded or tamped. This operation makes the concrete dense and removes any air pockets along the form faces. A one by four inch board six feet long sharpened on end like a chisel makes a very satisfactory spading tool. Forms are taken off just as early as possible, care being taken not to damage the concrete. If forms have been carefully made it will not be necessary to hammer or jar them to get them loose.

It is a good plan to go over the interior of the tank immediately with a wash of cement and water mixed to the consistency of paint. This helps to seal up any porous spots and adds to the ability of the tank to hold water without leakage. It also gives the tank a smooth glazed-like surface which is easy to keep clean.

For a week or ten days after concreting is completed the tank should be protected from the sun and wind so that concrete will not dry rapidly. Moisture is needed for concrete to harden properly and its strength will be reduced if there is too much evaporation. Sprinkling the new concrete two or three times a day for ten days increases its strength considerably. A covering of boards or straw to keep the sun from striking it is also a worth while precaution. Concrete hardens rapidly and the tank should be ready for use two weeks after it is made in warm weather. If built in cool weather give it a month to harden before using, especially if water is likely to be frozen in it.

New Publications

The T. L. Smith Company of Milwaukee, Wis., manufacturers of the Smith mixers, has issued its catalogue 405-C devoted chiefly to the description of Smith concrete mixers and bulletin No. 406 giving complete details of the Smith tilting mixer. These books are illustrated and contain tables of capacities, weights and general information which are of value to users of the mixers. Copies of these bulletins may be had by addressing the manufacturers at Milwaukee.

F. L. Smidth & Company of No. 50 Church Street, New York, have issued a bulletin entitled, "Saving Slippage and Space" which is devoted to a description of the Lenix, a device scientifically applied to belt drives for the purpose of giving large arcs of contact betwen belt and pulleys, provided with the means for automatically adding to or substracting from such arcs as the belt stretches or contracts in proportion to the power transmitted. The company will be glad to send a copy to all interested parties.

The Austin Manufacturing Company has issued its bulletin No. 30 descriptive of the Austin portable gyratory crushing and screening plants. This bulletin also contains complete descriptions of the various apparatus for road making, rock crushing and street cleaning machinery. Anyone interested may secure a copy by addressing the company at No. 400 N. Michigan Ave., Chicago.

The Anchor Concrete Machinery Company of Adrian, Michigan, has issued bulletins descriptive of the Anchor line of power concrete brick machines, and a new portable concrete machine for making Walter Concretile, a roofing material which is fire proof, storm proof, water proof and permanent. The company will be glad to mail copies of these bulletins to interested parties.

The Portland Cement Association this month has issued a booklet entitled "Concrete Data for Engineers and Architects," which contains the conclusions reached by the Lewis Institute of Chicago in its laboratory tests which have developed many previously unknown principles regarding concrete making. Though abbreviated

A concrete waterfall in a California garden. At night colored lights play on the falling water, creating a beautiful effect.

from the original reports, the principles are fully explained by both text and illustration. In addition, the booklet is of convenient size for filing and instant accessibility.

A recent and important publication by the Portland Cement Association is "Concrete in Home Sanitation," which contains under one cover the subject matter of several separate boklets as well as some newly prepared material on this important subject. It shows the way to make the home safe from typhoid fever, dysentery, and similar diseases, resulting in the loss annually of thousands of lives and millions of dollars—a loss which can be practically eliminated by following the simple suggestions for proper sanitation outlined in this booklet. A copy of this may be secured from the association or any of its district offices.

Doubleday, Page & Company of Garden City, New York have issued, "A Symbol of Safety," an interpretative study of a notable institution organized for service and written by Harry Chase Brearley. We quote from the introduction by W. H. Merrill, president of the Underwriters' Laboratories, Inc.:

"The author of this book was given every opportunity to make a study of the work of Underwriters' Laboratories, in order that he might convey an idea of its extent, diversity and significance, insofar as this is possible in a single volume. This is a story that never has been told, and I cannot doubt that a general understanding of our work will have a marked and helpful bearing on the development of its largest usefulness.

The Solvay Process Company of Syracuse, N. Y., is issuing a broadside showing the curing of concrete by means of calcium chloride.

E. I. du Pont de Nemours & Co., Inc., have published a book entitled, *Principles and Practices of Up-Keep Painting.* This work is a careful study of the general subject of plant and equipment maintenance and is a practical reference book whenever a specific problem arises. There are three chapters of immediate interest to our readers covering the treatment of concrete and cement surfaces, exterior concrete surfaces and interior concrete surfaces. As an appendix there is a color chart supplement, showing the various shades of du Pont prepared paints. One of the pages of this supplement is devoted to du Pont cement and stucco coating. The price of the work is $2.00 and it may be had upon application to the E. I. du Pont de Nemours & Co., Inc., 35th St. and Gray's Ferry Road, Philadelphia, Pa.

Looking west along the ideal section of the Lincoln Highway at a point near its center. As soon as the lighting system has been installed this will well earn its name of "Ideal."

Things That Make the Customer Buy From You

I

By John Lee King

In the course of a few articles that will appear in CEMENT AND ENGINEERING NEWS, the writer wants to attempt to get inside of the mind of that most important of all important human beings, the Ulimate Consumer, and to find out what things affect his decisions about buying. For after all, unless you and I who are engaged in marketing cement to the small user—or the large user, for that matter—understand clearly how his mind operates, we will probably have only a mediocre success in our business.

There are two chief ways in which we can tackle our problem: One of them offers a comfortable means of settling the issue as we would like to settle it, and the other a fair to middling chance of learning the facts. The first is that of deciding for ourselves just how this human animal ought to work under the conditions which we set up, and the other is to actually find out how he does act, and then make the conditions surrounding our business conform to our findings.

Take an example of the first method. A man invents a better, although different, way of doing a certain thing. He is convinced that his way is better: Therefore, he says, the Ultimate Consumer will discard the old way and patronize him. Sometimes the Ultimate Consumer comes up to his expectations; other times, however, that strongest of chains, habit, links him solidly to the old, and the inventor has had his pains and hopes for nothing. Theoretically he was right, but practically he was wrong, since his diagnosis of the workings of man's mind did not square with the facts.

Let us, then, consider just one of the things which it has been proved affects the mind of the average human being—and the average human being is in the majority, and from the sum total of his dollars must come your success if it comes at all—and leave to other articles the thousand and one other factors that are important. Let us get at it from a round-about way:

There's a new baby born in the village and in drop the neighbors, one by one, to congratulate the mother. Within five minutes of the arrival of each of the visitors it is safe to say that the question: "What is his name?" will be asked. If you don't believe me, check up the next time you get an opportunity and find out then I am right.

This is a case of actual working of the human mind: we can see it work: our own works the same way. The question of a name, or a handle, is of great importance to the human mind. After it has been attached to the child, and time brings with it the development of his outstanding characteristics, so that the mention of the one brings up an association of the other.

Let me demonstrate this fact a little further before showing how this fact—the importance of a name—applies to you and your business of selling cement to the Ultimate Consumer. In the selecting of the baby's name the chances are more than even that many names were considered only to be rejected because they were associated with some person or persons whom either the father or the mother did not like.

Now how does such a fact apply to business? If you have been in Now York City, and probably even if you have not, you know that the majority of the smart "shops" that cater to the wants of the well-to-do are located along a particular section of Fifth Avenue. Not meaning to detract either from the quality of any of these shops, or from the intelligence of those who patronize them, it is safe to say that location on "the Avenue" gives all of them a standing among many New Yorkers and out-of-town visitors that they would not have on any other street in the city. Since "Fifth Avenue" has come to represent in New York City the very best, just as Michigan Avenue in Chicago carries an air of exclusiveness, the shop-keeper who is willing to pay Fifth Avenue rents gets his return in sales based upon the importance of "What's in a name?"

Carry this a little further. On Fifth Avenue there are certain shops such as Tiffany's, for example — that have established their names as the mark of highest quality. For many who are particular, it is not sufficient that jewlery be purchased upon Fifth Avenue—it must be purchased at Tiffany's as well, to satisfy. In the early days no doubt, Tiffany's spent considerable thought and care in establishing reliability both in quality of merchandise and service, and undoubtedly, too, it spends thought today in maintaining it, yet it today is assured of an opportunity to sell many people because of its name alone. These people simply will not go into any other jewlery shop.

Listen to a group of women discussing recent purchases. Invariably the question will be put "Where did you buy it?" "Is it sterling?" or, about a watch, "How many jewels has it and what make?" And nine times out of ten the ordinary person will base his opinion as to the merit of the purchase upon a name rather than upon the actual quality of the article.

To such an extent is this true that many persons associate certain articles with certain names. A watch to many people suggests "Elgin," flour suggests "Pillsbury's Best," washing powder suggests "Gold Dust," and a suit of clothes means "Hart, Schaffner and Marx. Because this is true the producers of these products are making additional dollars that they would not have made had they not selected a name for their merchandise and behind that name placed the integrity of honest, square and efficient service.

Then one of the things that makes the consumer buy from you is the name of the product you handle; another, is the name of your firm. The two work together toward this end only if both names stand for quality and dependability. The first sale you make to a customer may be by chance—he may have needed cement and consulted the telephone directory and phoned you. How you handled his purchase, and how the cement performed will largely determine whether he makes subsequent purchases from you or not.

Because of this characteristic of the human mind, it pays to handle a well-known brand of cement, the trade-mark of which has back of it an already established reputation for reliability. To handle such a brand means to establish in the mind of the prospective Ultimate Consumer the idea that he can depend upon your goods, and then that, since you handle a cement that is recognized as good, you are yourself reliable.

That is why it is worth considering the importance of building a reputation, and then crystallize that reputation in a trade name. National advertising has made it simple for you to handle a trade-marked cement; tie this up with your name in such a way that the result means a good cement delivered to Mr. Ultimate Consumer to his satisfaction. That is one of the things that will make the Ultimate Consumer buy from you.

Just check up on yourself. There is a favorite motion picture house in your town. You generally find good pictures there. But whenever you see the name "Paramount" you have learned that you nearly always see a good picture. Well, most of those persons in your community whom you wish to patronize you react the same way.

So sell 'em cement, but guarantee it to them by a standard trade-mark, and make your own firm name a trade-mark of dependability.

Standardization

WASHINGTON, June 20.—What has been accomplished in establishing cement standards was referred to by Secretary of Commerce Hoover as a model for other industries in an address at a conference of state purchasing agents at the Department of Commerce.

"Industry itself has long struggled to establish standards and to secure their acceptance as a method of simplifying the process of manufacture and raising the ethics of production," said Secretary Hoover. "Furthermore, where standards and specifications are successfully developed by the government through the methods we have undertaken, they are receiving wide voluntary acceptance and adoption amongst public consumers. I need only to point to the case of cement, where practically the whole output of the country is now produced and distributed on the basis of Federal standards and tests—it being sufficient in the purchase of cement simply to state 'Federal specifications.' It has been a great boon to the cement industry to establish the uniformity and quality of its products; it has been an even greater boon to the construction industries of the country to share in the benefits of such establishment of quality and such method of test."

As a sequence to the meeting of state purchasing agents a conference was held at the Department of Commerce with various technical and other associations with a view to the formation of an advisory committee to cooperate with the Department and state purchasing agents' associations in the work of formulating purchase standards, specifications and tests for various materials needed by the national and state governments. It is proposed to review specifications now in use and to issue and formulate a handbook for the use of public purchasing agents covering the entire field of standards, specifications, simplifications and tests which may be determined as the basis adopted for public purchases.

Hearing on Rates

WASHINGTON, June 15.—A hearing on Western cement freight rates has been set by the Interstate Commerce Commission for July 16 at the Great Northern Hotel at Chicago. The hearing will be conducted by Examiner R. V. Pitt. The hearing is a reopening of a case involving rates on cement between points in Western trunk line territory and between points in Western trunk line territory and adjacent territories.

An order issued by the commission in connection with the case follows:

"Whereas, the fourth section of the interstate commerce act, as amended, provides that in exercising the authority conferred upon it to relieve carriers in special cases from the provisions of that section—

> "the Commission shall not permit the establishment of any charge to or from the more distant point that is not reasonably compensatory for the service performed."

"And Whereas, Fourth Section Order No. 7260 entered in docket No. 8182 March 26, 1918, as amended from time to time, does not contain any limitation upon the relief granted so that it applies to carriers whose routes are extremely circuitous and via which rates might, therefore, be applied that are not reasonably compensatory as required by the above mentioned provision of the fourth section as amended;

"And Whereas, Instances have been brought to the attention of the Commission where rates are being applied via routes under the relief granted by the said order which are so extremely circuitous as to make it doubtful that such rates are reasonably compensatory for the service performed;

"It is ordered, That docket No. 8182 and applications covered by fourth section order No. 7260 entered therein March 26, 1918, as amended from time to time, be, and they are hereby, reopened for further hearing on the question of fourth section relief with especial reference to the reasonably compensatory character of the rates prescribed in the above mentioned proceeding when applied via circuitous routes.

"It is further ordered, That the said proceedings be, and they are hereby, assigned for further hearing on the question of fourth section relief as indicated in the preceding paragraph hereof at Great Northern Hotel, Chicago, Ill., on July 16, 1923, at 10 A. M. before Examiner R. V. Pitt.

"And it is further ordered, That the orders entered in these proceedings on March 26, 1918, as amended by orders entered therein from time to time, shall remain in full force and effect.

"The attention of the applicants is directed to the fact that in order to comply with the requirement of the fourth section that relief shall not be granted to establish rates that are not reasonably compensatory for the service performed it will be necessary to impose a limitation upon the relief which may be granted as a result of these proceedings.

"For this purpose two forms of limitations have been suggested as follows:

"(1) That the relief shall not apply to circuitous routes that are more than a certain per cent longer than the short line between competitive points, the percentage to vary according to the length of the haul involved; for example, 125 per cent longer when the short line distance does not exceed 25 miles; 100 per cent where the distance via the short line is 26 to 50 miles, and 80 per cent where the short line distance is from 50 to 100 miles, etc., and

"(2) That the relief shall not apply when the rate which is to be established by the circuitous line to meet short line competition is less than a certain per cent of the rate under the mileage scale for the distance via the circuitous line between the competitive points involved; for example, if the rate under the mileage scale for the distance between the two competitive points via a circuitous route is 30 cents, the relief would not apply if the rate proposed to meet short line competition between the said points is less than 80 per cent of the normal rate of 30 cents.

"It is important therefore that interested parties be prepared at the hearing of this matter to introduce testimony respecting the propriety and feasibility of the plans suggested, or in support of modifications thereof that may be proposed, or other plans of limitation offered as substitutes therefor."

Shippers and Railroads

WASHINGTON, June 20—Cement manufacturers are represented on regional advisory boards which have been organized in various parts of the country by the American Railway Association to bring about the fullest measure of cooperation between the shippers and the railroads. The advisory boards, which are composed entirely of shippers and selected by the shipping public, will work in conjunction with the district manager of the Car Service Division and representatives of the railroads. The boards have been organized in five districts, in the Southeast, Southwest, in the Trans-Missouri-Kansas section, the Central West, and in the Northwest.

A sub-commitee on cement of the Southwestern regional advisory commitee is headed by J. G. West of the Texas Portland Cement Company of Dallas. A subcommittee on sand, stone, gravel and clay products of this same board is headed by Rhea Miller of J. Fred Smith Gravel Company of Dallas. A sub-committee on sand, gravel and slag of the Southeastern regional board is headed by J. S. Waterman of the Southeastern Aggregate Producers' Association, Atlanta. A sub-committee of the Southeastern board on heavy clay products and brick is headed by M. B. Greenough of the Southern Clay Manufacturers' Company, Chattanooga, Tenn. Members of the executive committee of he Trans-Missouri-Kansas board include R. W. Moore of the Dewey Portland Cement Co., Kansas City, E. S. Gubernator of the Lehigh Portland Cement Company of Chicago, and W. D. Wells of the W. S. Dickey Clay Manufacturing Company of Kansas City, Mo. A sub-committee of the Central Western board on road and building materials is headed by Lloyd Hansen of Hastings, Neb.

Cement Transport High

WASHINGTON, June 20—The Interstate Commerce Commission has just prepared for the first time a tabulation showing the revenue derived by railroads from transportation of various classes of commodities. The revenue is estimated on the basis of 1922 tonnage at 1923 rates.

In the case of cement the annual revenue is estimated at $52,329,000 on a basis of 18,454,450 tons originating on railroads and 36,513,841 total tons carried, the latter figure including tonnage received from connecting carriers. The revenue per ton for the United States as one system for cement is estimated as $2.84 while for the individual railway the figure is $1.43. The revenue per car for the United States as one system is $106.93 while by the individual railway it is $54.21.

The estimated annual revenue from carrying lime and plaster is $32,284,000 on a basis of 15,606,849 tons originating and 24,886,805 total tons carried. The revenue per ton is $2.07 for the United States as railway. The revenue per car is $71.10 for the United States as one system and $44.27 by the individual railway.

The estimated annual revenue for carrying clay, gravel, sand and stone is $105,530,000 on a basis of 102,677,414 tons originating and 139,436,476 total tons carried. The revenue per ton for the United States as one system is $1.03 and by the individual railway 76 cents. The revenue per car for the United States as one system is $49.42 and by the individual railway $35.74.

Members of the force at the Northwestern States Portland Cement company's plant, at Mason City, Iowa, have received word of another raise in wages of 5 cents an hour, which will become effective June 15. This is the second raise this spring, C. H. McNider, president of the company, stated, as April 1 a similar raise was given.

A cross section on the Bates experimental road near Springfield, Illinois, showing that the concrete on the edges is nine inches thick.

The city of Santa Barbara, California, is a haven for those bent on picnicking. A number of cement tables have been erected in one of the canyons, and here, with their meals spread out on dainty cloths, one can have an enjoyable time beneath the trees.

Foreign Cement Captures Panama

WASHINGTON, June 20.—Conditions which have made it difficult for American cement manufacturers to sell their products in Panama and which have resulted in increased imports of European cement are described in a report received through government channels from Panama City. It is suggested in the report that American cement would be able to resume its former position in the Panama market if a readjustment of prices at the seaboard and also of ocean freight rates were made.

"The situation at the present time is that there is practically no market for cement of American manufacture in the country," says the report. "Local contractors and dealers are thoroughly familiar with American standard brands of cement, and conditions of price and quality being equal, they would probably be ordered in preference wherever the commodity was required.

"During the year 1921 German cement was introduced in considerable quantities, but this has not given entire satisfaction. Norwegian cement imported in 1922 and since that period has been found to compare very favorably with standard American makes and is now being received in larger quantities. It is reported that none of the local dealers in building materials are now handling American cement, and that, of the principal importing firms one company dealers in German cement and the other concerns in Norwegian cement.

"'Alsen' brand German cement was formerly on the local market in considerable quantities, and lately bids have been made on, and shipments received of, 'Leon,' 'Dalen' and 'Aguila' brands of Norwegian cement.

"The most recent bid submitted for the furnishing of cement was for 1000 barrels to be used on the construction work at the New Santa Tomas Hospital, Panama City, the price being $3.20 per barrel delivered on the work. 'Leon' brand cement was specified in the contract drawn up between the Panama government and the bidder.

"Norwegian cement is quoted at the present time at $2.50 per barrel, c. i. f. Balboa, Canal Zone, to the principal importing firms; $1.80 of this amount is the invoice value at the point of shipment and the remaining $0.70 represents freight and insurance. Against this charge of $0.70 ocean freight and insurance, the freight charges on the Panama Railroad Steamship Line are $0.35 per 100 pounds or $1.20 per barrel for cement from New York to Panama City. There is, however, a transfer and handling charge of $0.35 a barrel made by the Panama Railroad for transferring the cement from Balboa to Panama City, so that total charges to Panama City compare as follows:

"From Scandinavian port: $1.05, including insurance. From New York: $1.20, without insurance.

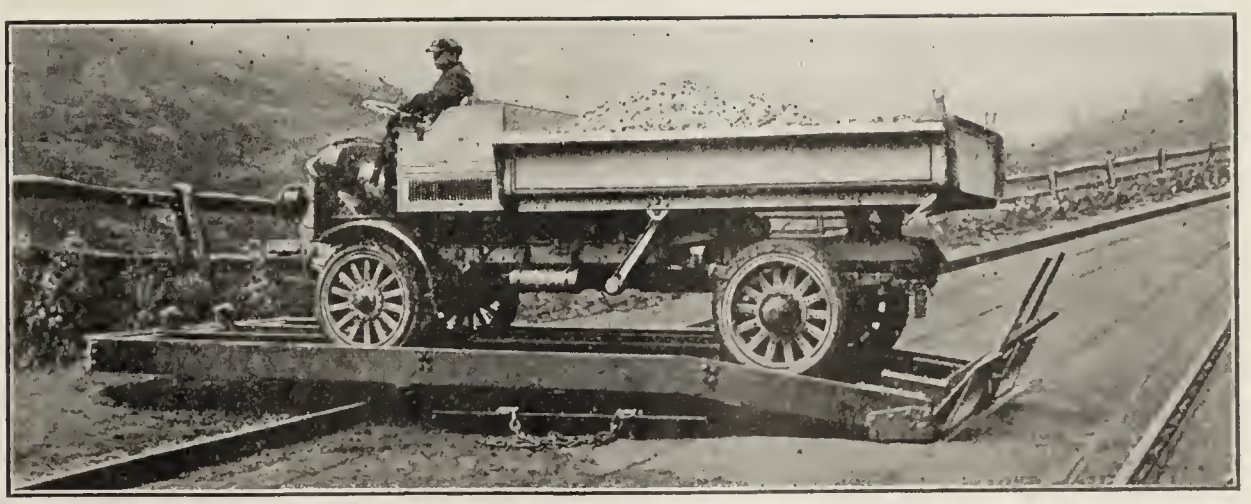
"Prices quoted by American cement manufacturers at the present are $2.10 or $2.15 a barrel, f. o. b. New York, making the cost delivered at Panama City $3.30 or $3.35 a barrel as compared with $2.50 plus $0.35 transfer and handling charges or $2.85 a barrel for Norwegian cement. It is obvious from the above figures that local dealers even though they were predisposed in favor of American cement, cannot compete with the Scandinavian output.

"This would seem to be the proper time for a readjustment of prices at the seaboard and ocean freight rates to permit American cement to resume its former position in this market, for if the foreign makes control it for any considerable period it will be increasingly difficult to regain the trade lost.

"It is appreciated that American cement manufacturers may not at this time be greatly interested in the export trade for the reason that domestic demands are sufficient to consume the whole of their output, but whether or not such is the case, the situation appears to be worthy of careful consideration. As a matter of probable interest in this connection it may be stated that a local firm is in receipt of a letter from an American company offering quotations for 'Dalen' cement in large quantities, and stating that the quota the manufacturers fix for the United States is 200,000 barrels."

Up to the last two or three years nearly all of the cement imported into Panama came from the United States. Since 1921, however, imports of cement from Germany, Norway and Sweden have greatly increased. Imports of cement into Panama in 1920 from the United States were valued at $112,767 out of total imports valued at $115,618. In 1921 imports of United States cement were valued at $90,382 as against German cement valued at $33,078, and Norwegian cement valued at $7,765. In 1922 imports of United States cement dropped to $46,450 while imports of Norwegian cement were valued at $21,905 and Swedish cement at $12,424, German cement at $8,811 and cement from Holland at $5,043. In 1913, the last pre-war year, imports of cement from the United States were valued at $88,408 as against $2,543 from Germany, $1,611 from Belgium and $1,214 from Spain.

WASHINGTON, June 20.—A report to the Department of Commerce from Vice Consul R. M. Newcomb, Victoria, B. C., states that the Minister of Public Works of the British Columbia Government, Parliament Building, Victoria, British Columbia, Canada, has announced that the Province will expend $2,300,000 on road construction and bridges for the year 1923. The chief items of new work on Vancouver Island will be: Completion of three miles of cement concrete paving on the Victoria-Sidney road; construction of the Tofino-Ucluelet road on the west coast of Vancouver Island, $10,000; two miles of hard surface at Nanaimo and Fulford Harbor road.

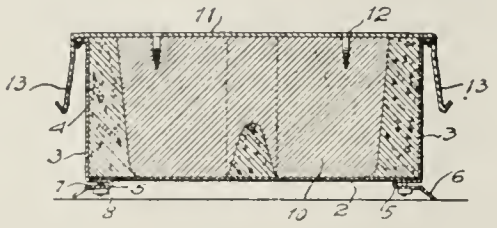


A great time saver for contractors is shown in this illustration, which shows the operation of a turn table for motor trucks.

Interesting Cement Patents

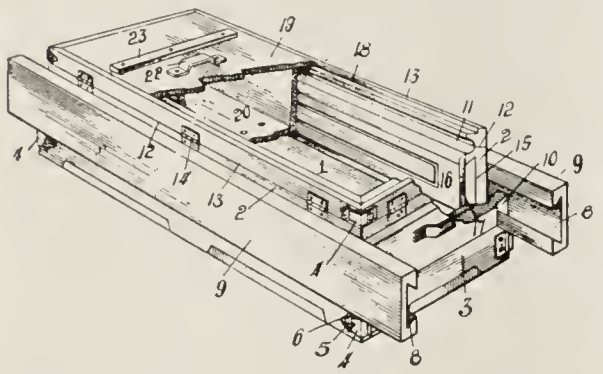
Recent Patents of interest to readers of the Marine News specially prepared for this publication by Clarence A. O'Brien, Registered Patent Attorney, 230 Southern Building, Washington, D. C.

1,457,991. MOLD FOR TILES OR BLOCKS OF CONCRETE. Merrill Moore, Creston, Iowa. Filed April 18, 1922. Serial No. 554,744. 7 Claims. (Cl. 25—121.)



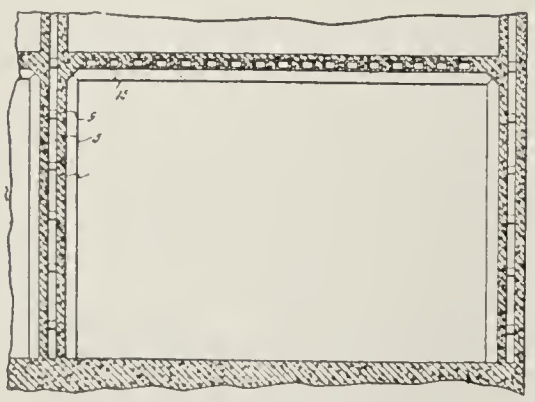
1. A mold of the character described comprising sides and a bottom member, and end members each formed with an open folded portion beneath the bottom, said folded portions terminating in an inclined downwardly and outwardly extended inclined portion forming a seat for said mold, and means for yieldingly securing the end members to the bottom.

1,457,767. MOLD FOR PLASTIC FLOWER BOXES OR THE LIKE. William A Carey, Toledo, Ohio. Filed Nov. 12, 1921. Serial No. 514,470. 4 Claims. (Cl. 25—121.)



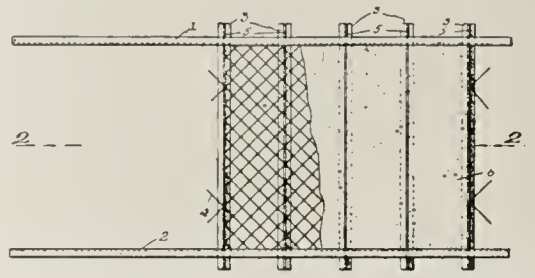
1. A mold of the class described having separable side and end members, a side bar disposed at the outer side of each side member longitudinally thereof, the end members and side bars having releasable dove tail connection which permit movements of the end members longitudinally of the side bars and cause the side bars and end members to cooperate to firmly hold the side members against outward movements.

1,458,034. MOLD. Michael James Davin, Danville, Ill. Filed Dec. 9, 1922. Serial No. 605,899. 1 Claim. (Cl. 25—131.)



A building form consisting of inner and outer pairs of sections having their inner pairs spaced apart to form an air space and the inner sections having inclined corners to make the corners of the building of great thickness, means for tying the two parts of each wall together, such means consisting of tie members having enlarged ends which are embedded in the walls, said members having nut members therein and tie rods having threaded parts engaging the nut members for tying the outer forms in place.

1,457,999. CONCRETE FORM. Waldemar Julius Pedersen, Floral Park, N. Y. Filed Sept. 20, 1920. Serial No. 411,653. Renewed April 21, 1923. 10 Claims. (Cl. 25—121.)



1. A concrete structure comprising a plurality of separate sections disposed adjacent each other, connections extending between the sections, the portions of abutting faces of adjacent sections being angularly disposed with respect to each other, and other portions of abutting faces of the adjacent sections being disposed substantially flat against each other.

7. A concrete form comprising a plurality of spaced, parallel, longitudinal bar frames, a plurality of V-shaped bars disposed transversely with respect to said frames, and a plurality of flat bars placed over the V-bars, their lower edges coinciding with the apex line of the V bars.

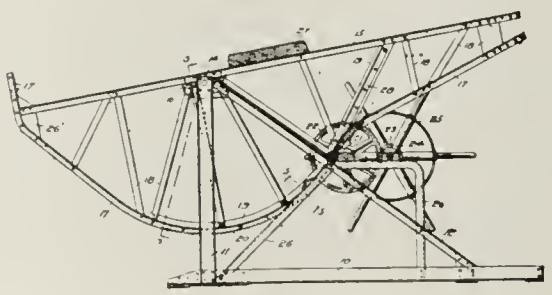
Ser. No. 178,642. (CLASS 12. CONSTRUCTION MATERIALS.) The United States Portland Cement Company, Denver, Colo. Filed April 5, 1923.

No claim is made for the word "Concrete" apart from the mark shown by the drawing.

Particular description of goods.—Portland Cement.

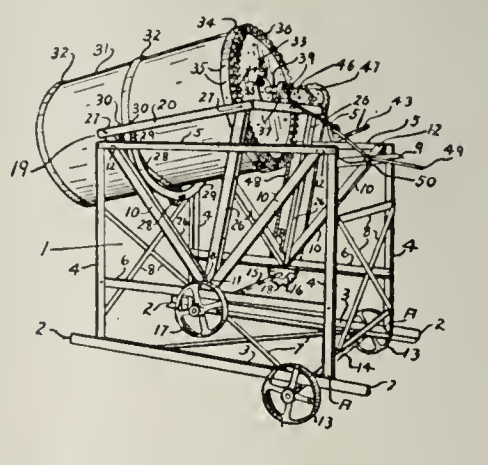
Claims use since May 18, 1906.

1,457,684. ERECTION OF CONCRETE BUILDINGS. Robert H. Aiken, Winthrop Harbor, Ill. Filed April 17, 1922. Serial No. 553,510. 5 Claims. (Cl. 25—131.)



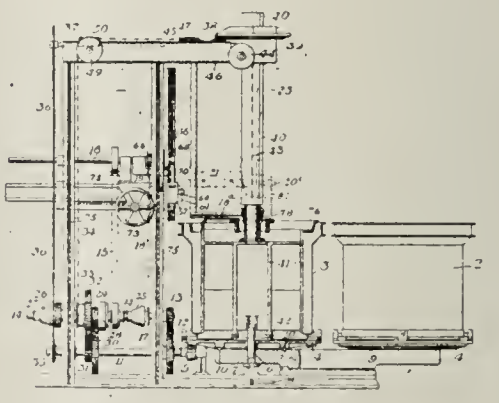
1. In apparatus of the class described, the combination with a supporting frame, of a series of like truss beams all pivotally supported between their ends on a transverse axis with their upper members in an approximately horizontal plane and bearing a floor upon which a concrete wall may be formed, the lower members of all the trusses being marginally geared, far below the upper members, curved about said axis, extending obliquely toward the ends of the upper members, and engaged respectively, by worm gears mounted on a power shaft.

1,453,634. CONCRETE MIXER. David Buffington Martin and John Westerby, Hagersville, Ontario, Canada. Filed Dec. 15, 1921. Serial No. 522,572. 2 Claims. (Cl. 83—73.)



1. In a concrete mixer the combination with the rigid main frame thereof, of a V-shaped rocker guide frame within the main frame, a rocking frame comprising a depending V-shaped portion the apex angle of which is less than that of the aforesaid guide frame, the rocker frame freely mounted within the main frame so that the external apex of the depending V-shaped portion thereof engages the internal apex of the guide frame, the rocking frame being free to be oscillated about the engaging apices, and a mixing drum rotatably carried by the rocking frame.

1,453,269. CONCRETE-PIPE MACHINE. Charles F. Buente, Pittsburgh, Pa. Filed Aug. 6, 1921. Serial No. 490,292. 23 Claims. (Cl. 25—37.)



1. In a concrete pipe machine, the combination of a mold, a core therefor, means for rotating said mold, means for causing a relative rotative movement between said mold and core, means for maintaining a uniform feed of concrete into said mold in the formation of one size of pipe, and means whereby the rate of rotation of said mold may be varied and the rate of feed varied inversely to the rate of rotation of the mold in the formation of another size of pipe.

Air Power on Kentucky Highway

By D. P. O'Rourke

The accompanying photographs show how Ping Bros. Construction Company have been putting their contract at Greensburg, Ky., through on time, by depending on compressed air drills and a portable compressor to get rid of rock on this highway job.

Green County, one of the progressive tobacco raising counties of central Kentucky, let a contract, early this spring, to Ping Bros. for grading the six miles north of Greensburg on the road to Hodgenville. This highway, intersecting the Jackson Highway, will give Green County two outlets, the old one being via Campbellsville and Lebanon.

This job includes about 15,000 cubic yards of rock excavation, the rock encountered being the ordinary limestone common to the central and blue grass section of the state.

The equipment employed for this part of the job consists of a Sullivan hollow piston Rotator, operated by a Class WK-34 Sullivan portable air compressor, driven by belt from a standard Fordson tractor. The compressor is 8x8 inches in size, giving a displacement of 121 cu. ft. of air against 100 lbs. pressure. The tractor serves the double purpose of hauling the outfit from place to place and of operating the compressor when drilling is to be done. The tractor is, of course, available for other hauling work when not occupied on this job.

The country through which the road is being constructed is hilly, including a number of rock cuts, the maximum grade in these being seven per cent. The Rotator is shown at the start of a heavy cut on the outskirts of Greensburg. At this point it was necessary to drill shallow holes and shoot lightly on account of the neighboring residences. On other parts of the work holes ten and twelve feet were readily drilled with the Rotator.

The compressor is driven by belt from the tractor.

A rotator drilling for blasting on the highway.

The portable drilling outfit described above makes an inexpensive and very convenient rig for any road or street contractor, especially if he already owns a Fordson. Other types of portable compressors include electric motor driven machines in several sizes and gasoline engine driven direct-connected self-contained outfits, the latter having a capacity of two to three drills.

Railroad trackage to the site of the million-dollar cement plant to be constructed southeast of Fort Worth by the Southwestern Portland Cement company, is being laid, it was announced by J. W. Dreisbach, construction superintendent, recently.

Portland Cement Output in May

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement, but in part on estimates. The estimates for May, 1923, were made necessary by the lack of returns from two producers.

Production, shipments and stocks of finished portland cement, by districts, in May, 1922 and 1923, and stocks in April, 1923, in barrels.

Commercial District	Production May		Shipments May		Stocks at End of May		Stocks at End of April
	1922	1923	1922	1923	1922a	1923	1923a
Eastern Pa., N. J. & Md.	2,964,000	3,347,000	3,708,000	3,782,000	3,563,000	3,342,000	3,778,000
New York	549,000	683,000	680,000	729,000	869,000	759,000	804,000
Ohio, Western Pa. & W. Va.	998,000	1,393,000	1,092,000	1,424,000	1,302,000	1,011,000	1,042,000
Michigan	713,000	722,000	743,000	806,000	782,000	555,000	640,000
Ill., Ind. & Ky.	1,883,000	1,965,000	2,068,000	2,511,000	2,361,000	755,000	1,301,000
Va., Tenn., Ala. & Ga.	509,000	643,000	628,000	672,000	399,000	184,000	213,000
Eastern Mo., Ia. & Minn.	1,247,000	1,287,000	1,381,000	1.472,000	1,700,000	1,509,000	1,694,000
Western Mo., Neb., Kan. & Okla	726,000	902,000	726,000	856,000	854,000	929,000	883,000
Texas	271,000	375,000	323,000	424,000	291,000	235,000	284,000
Colo. & Utah	250,000	288,000	249,000	274,000	164,000	177,000	163,000
California	757,000	977,000	831,000	977,000	259,000	139,000	139,000
Ore., Wash. & Mont.	309,000	328,000	320,000	330,000	349,000	520,000	522,000
	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	10,115,000	11,463,000

a—Revised.

Stocks of clinker, or unground cement, at the mills at the end of May, 1923, amounted to about 4,454,000 barrels compared with 5,006,000 barrels (revised) at the beginning of the month.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in March, 1923, amounted to 66,521 barrels valued at $113,903. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in March were, from Denmark, 43,460 barrels; Norway, 21,012 barrels; Belgium, 1,287 barrels; other countries, 762 barrels. The imports were received in the following districts: North Carolina, 27,827 barrels; Porto Rico, 16,246 barrels; Hawaii, 8,656 barrels; South Carolina, 5,779 barrels; New Orleans, 3,372 barrels; Florida, 3,032 barrels; San Francisco, 1,471 barrels; other districts, 138 barrels.

The exports of hydraulic cement in April, 1923, were 85,662 barrels, valued at $239,047, of which was sent to Cuba, 38,370 barrels; to the other West Indes, 1,899 barrels; South America, 24,865 barrels; Mexico, 10,091 barrels; Central America, 7,573 barrels; Canada, 615 barrels; and to other countries, 2,249 barrels. The total exports of hydraulic cement in 1922 were 1,127,845 barrels, valued at $3,206,201.

The statistics of imports of hydraulic cement in April and May, 1923, and of exports of hydraulic cement in May, 1923, are not available.

Imports and Exports of hydraulic cement, by months, in 1922 and 1923, in barrels. a.

Month	Imports 1922	Imports 1923	Exports 1922	Exports 1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	(b)	75,412	85,662
May	2,524	(b)	100,068	(b)
June	14,198	.....	96,263	.....
July	957	.....	119,491	.....
August	56,737	.....	105,156	.....
September	c 42,641	.....	78,615	.....
October	d 65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823	.....	1,127,845	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce. (b) Imports in April and May, 1923, and exports in May, 1923, are not available. (c) Imported during period Sept. 1-21, inclusive. Imports during period Sept. 22-30 are included with Oct. (d) Includes imports during period Sept. 22-30.

News of the Cement Mills

The Sun Portland Cement Company, Portland, Ore., is expending more than $1,000,000 for equipment in its plant, located about five miles west of Huntington, Ore.

The National Cement Company, 90 James St., Montreal, Quebec, Can., is planning a plant which will have a capacity of 3,000 barrels a day. The company's authorized capital is about $4,000,000, and the new plant will cost about $1,800,000. I. R. Bernard, Fall River, Mass., and John F. Hurley of Boston, Mass., are directors.

The Riverside Portland Cement Co., Riverside, Cal., has a daily capacity of 6,500 barrels a day, it was announced at a meeting at Los Angeles of Pasadena and Los Angeles capitalists, yet it could not begin to supply the demands made upon it, and that within a short time its capacity will be doubled. Stanley Henshaw of San Francisco is one of the owners and the person who made the announcement.

Press reports stated that the Clinchfield Corporation this year are to build a big factory at Coreen, Ga., about thirty miles below Macon. This plant will have a daily capacity of 2,000 barrels. It is the property of the Clinchfield Portland Cement Corporation and is said to be rich in the deposits used in the manufacture of cement. Headquarters of the Clinchfield Corporation are at Kingsport, Tenn. The corporation is capitalized at $2,500,000, and the new plant at Coreen will cost approximately $1,500,000. It is not definitely stated when the new plant will commence operation.

The *Chicago Journal of Commerce* under date of June 25 states that the reserve stock of portland cement in the hands of producers in the Chicago territory is exhausted and that all shipments are limited to the daily production. In the meantime a famine threatens as the local distributing centers are barren of supplies.

According to the San Bernardino, Cal., *Sun*, the purchase by the Riverside Portland Cement Company of the Golden State Cement Corporation's plant and property at Oro Grande was announced. The deal involves nearly two million dollars. The acquisition by the Riverside corporation of the Oro Grande plant makes it the largest cement producing corporation west of the Mississippi River. The combined capacity of the various plants make a daily capacity of 10,000 barrels a day. It is stated that the capacity of the Oro Grande plant will be tripled, increasing the production to 3,600 barrels per day.

Work on the state cement plant at Rapid City, S. D., is progressing rapidly, it is announced by Carlson & Snitkey, the general contractors of Sioux City.

First definite steps toward the construction of a million dollar cement manufacturing plant were taken with the purchase by the Southwestern Cement Company of 620 acres of land southeast of Fort Worth, Tex., at a price of $100,000.

The nummulitic limestone used in the construction of the Pyramids and the Nubian sandstone of the Colossal structures of Thebes will be asked to compete with American cement for durability if the Department of Commerce can find an American merchant interested in exporting 1,500 tons of cement to Egypt.

The Kerr Portland Cement Company, Moundsville, W. Va., contemplates erecting a $1,500,000 cement plant at Round Bottom, W. Va., a short distance from Moundsville. The new company will have a daily capacity of 3,000 barrels a day and the plant will be ready by the fall of 1924. About $15,000 has already been spent in preliminary work.

The Arrowhead Portland Cement Company, W. H. E. Bravender, president and general manager, has started on its plant near Devore, Cal.

The Pyramid Portland Cement Company, Valley Junction, Iowa, is putting the finishing touches to its plant and the mill will be ready to operate by July 5. Capacity of the plant is 3,000 barrels daily.

To accommodate families of its several hundred workers, the Sandusky Cement Co., which recently completed a $1,500,000 plant at Silica, O., began work on Monday on what will be a small town comprised of 150 to 200 homes and the stores and other business that will be attracted to it.

Contract for the first 10 of the homes to cost $4,500 each was awarded Saturday to the Newton-Baxter Co. of Toledo. Work was started Monday. The company will hold title to the homes and will rent them to the workers in the big cement plant. Street paving, sewers, electric lighting and sidewalks are to be installed immediately.

According to a news dispatch in the Portland, Ore., *Journal,* limestone from the Marble Mountain quarry of the Beaver Portland Cement Company will be hauled to Gold Hill within the next three weeks, according to J. A. Johnsrude, manager of the California & Oregon Coast Railway.

The steel has been laid from Wilderville to the foot of the mountain for a standard gauge road. From the foot of the hill to the top of Marble mountain there is a three-track tramway. The steel yet remains to be laid on the quarter mile of road on top of the mountain. This track will connect the quarry and the crusher.

Thousands of tons of 98 per cent pure calcium carbonate are in sight at the top of the mountain. The huge marble cliffs overhang the railroad and will provide sufficient marble to keep the plant operating for years, in the belief of the officials, who authorized the expenditure of the money for the construction of the railroad through some extremely rough country. The work was started last November and is just now being completed.

The Fresno, Cal., *Herald* states that: "Actual construction work on the nine or ten miles of railroad which will connect Lemon Cove and Three Rivers and be used by the San Joaquin Portland Cement Company, which will develop the "Marble Mountain" cement deposit at the latter place, will be under way by mid-summer, according to authentic information received here today. Whether the railroad will be an independent line handling only the cement company's deposits to the plant, which is to be erected six miles north and a little east of Exeter, near Merryman, or whether it will be built by the Southern Pacific's auxiliary feed line, the Visalia Electric and be also a passenger line, has not been definitely announced. It is, however, intimated by the sources giving out what little information has become public knowledge that the line will handle only the freight for the cement company between Lemon Cove and Three Rivers, where it will connect with the Visalia Electric Railroad.

"It is declared the engineers who have been running the recognizance survey for the line have declared the grade to be exceptionally good all the way from Lemon Cove with the hardest pull just above Lemon Cove as the line passes through the gap by Lime Kiln hill. It is, however, pointed out that in all probability arrangements may be made for freight hauling over the line after it gets into running order.

"John F. Hamburg, former vice-president and general manager of Hackfeld & Co., Honolulu importers and shippers, is at the head of San Joaquin Portland Cement Company, which a short time ago came into possession of the state school lands located just to the south of Three Rivers and on which it is declared, exist the largest single cement deposit in the entire country west of the Rocky Mountains."

WASHINGTON, June 20—Bids for the construction of from eight to ten miles of trans-mountain road in Glacier National Park were opened on June 8 in the office of the National Park Service at Glacier Park Station, Montana, according to an announcement by the Interior Department.

The starting point of the road will be near the foot of St. Mary Chalet where it joins the Blackfeet Highway now built. Crossing the St. Mary River on a 90-foot span bridge, to be constructed, the road will be built along the north shore of St. Mary lake in the direction of the Going-to-the Sun Chalet. Glacier Park Station, the nearest railroad point, is about thirty-two miles by automobile road from the beginning of the work. The amount available for construction is about $85,000.

Building Forecasts

(Continued from page 26)

higher than in 1913. Since the low point in January, 1922, the general level of prices has risen fourteen per cent, while prices of building materials have increased over 30 per cent. During the period of these price advances the production of basic commodities, as measured by the board's index, has increased 44 per cent, while the output of building materials has increased 59 per cent. This activity in the industries producing construction materials has been accompanied by rapid increases in the prices and production of house furnishings. This pressure for labor and materials resulted not only in full employment at high wages and in large advance orders for construction materials, but in actual shortage, duplication of orders, and some evidence of speculative activity.

"This situation in the building industries has been recognized both by the government and the trade itself."

News of the Concrete Products Factories

J. F. Ketchey of Dallas, Tex., concrete contractor, is specializing in the construction of concrete garages and has erected a work shop and supplied it with the necessary machinery for making precast concrete units for this purpose. He expects to develop a satisfactory business of the fireproof structures.

The Wilson Re-Enforced Concrete Company of Red Oak, Iowa, has taken over the plant of the Central Bridge & Construction Company of that city.

Camp & Du Puy, 424 East Adler Street, Portland, Ore., have prepared plans and will build for Joseph Supple, shipbuilder, East Water and East Main streets, a concrete factory building of one story, 50x100 feet, os East Seventh between East Pine and East Ash, to cost $8,000.

The Pickard Anchor Concrete Company has now moved to its new location at Fifty-sixth and Center Streets, Omaha, Neb. The buildings are constructed of cement blocks, which makes them practically fire proof and moisture proof. When the steam rooms, which are now under construction, are completed, the plant will be one of the most modern plants in the city. It will have a daily output of 2,000 blocks.

The plant of the W. O. Johnson Cement Products Company is located at Third and Pacific Streets, Omaha, Neb. It covers four acres of ground and is one of the best equipped cement products plants in the west.

The Norristown Concrete Company of Norristown, Pa., has a plant with a capacity of 2,000 blocks daily. It is at present working at capacity as the plant cannot make its product fast enough to supply the local demand. The plant in itself is modern in every detail. The cement, slag and sand is stored in four silos, each having a capacity of 1,000 tons. These materials are then fed into an automatic mixing valve, and then stamped into moulds by four iron stampers, each having a 700 pound pressure.

The First National Bank Building of Pomona, Cal., which is in the course of erection, will utilize 28,000 sacks of cement in the building.

The Watry & Hack Company, R. D. No. 4, Box 117B, West Allis, Wis., has been recently incorporated by L. Watry, president, and C. Hack, secretary. They write us that they operate their own design well pipe molds and a Remmel mixer. They want prices and catalogs on molds for making staves, ash and garbage receptacles, sewer pipe, septic tanks, etc. Also want mixers, waterproofing compounds. Writes us as follows: "We are open to consider any marketable concrete product which we can manufacture during the winter months. Preferably those marked above."

The Economy Concrete Company of Virginia, Richmond, Va., has been recently incorporated by J. Scott Parrish, president; J. S. Archer, secretary. Writes us as follows: "We contemplate making concrete pipe and building blocks in the near future. We want prices and catalogs on mica spar crystals, white sand, marble chips and white cement. We plan to make at first decorative concrete stone, such as made by the Economy Concrete Company, New Haven, Conn."

The Atlas Cement Products Company, Aitken, Minn., has been recently incorporated and operates a Multiplex block machine, W. D. Hale mixer and Brooks concrete silo molds. Want prices and catalogs on molds for making burial vaults, culverts, drain tile and septic tanks. Also interested in mica spar crystals, white sand, marble chips and water proofing compounds.

The Cement Post Company, Miami, Fla., has been recently incorporated with a capital of $10,000 by A. W. Eisenmayer, Jr., president, and A. L. Brost, secretary-treasurer.

F. K. Shallow, Gilroy, Cal., has been conducting a new industry in Gilroy without much publicity. He is making a new style of cement block for building purposes. They are made of the finest Monterey sand and crushed rock with Mission cement.

The Seaboard Concrete Products Company, Great Neck, N. Y., has been recently incorporated with a capital of $25,000 by E. Cudlip, E. Breuer and S. A. Sahm.

M. G. Hamilton, Burlington Junction, Mo., operates a Greer block machine, Greer tamper and Frank mixer. Wants prices and catalogs on machines for making chimney blocks, vases, drain tile, porches and brick.

The Ford Block Company, E. A. Ford, general manager, Ashland, Ky., contemplates the erection of a plant to manufacture cement and gravel blocks.

The United Sand & Gravel Company, 214 E. Columbia St., Fort Wayne, Ind., writes us that it contemplates manufacturing concrete products such as tile, brick and blocks.

The Harrisburg Building Block Company, T. F. Bausman, president, Harrisburg, Pa., operates a Multiplex building wall tile machine and block machine and a Blystone mixer. Writes us that it will manufacture Straub patented cinder concrete building blocks about July 5, 1923. Wants prices and catalogs on machines for making septic tanks, fence posts and brick. Also wants prices and catalogs on transfer cars, truck conveyors, sack cleaner, and would like to hear from manufacturers of overhead conveyor systems.

The G. W. Martin Concrete Block & Supply Company, 105577 W. Jefferson St., Detroit, Mich., has been recently incorporated for $2,000.

The Precast Concrete Company, Culver City, Cal., has been recently incorporated with a capital of $20,000 by M. J. Francis, V. W. Merritt and others.

John Stabile, Coral Gables, Fla., will establish an ornamental stone and cement products plant to cost about $15,000.

The Hibbing Cement Construction Company, Hibbing, Minn., has been incorporated with a capital of $50,000 by J. A. Flower, Adolph Sanoglia and others.

The Merritt Concrete Products Company, 727 Chapman St., San Jose, Cal., is planning the erection of a new plant on the Monterey road estimated to cost $50,000 with machinery.

The Buckeye Tile Company, E. J. Hydell, general manager, Chillicothe, Ohio, will install material handling equipment and machinery for making tile.

The Genesee Sand & Gravel Corporation, near Bowmanville, N. Y., is erecting a concrete products plant to manufacture building tile.

The McArthur Concrete Tile & Foundation Company, St. Louis, Mo., has been recently incorporated with a capital of $50,000 by A. F. McArthur, F. C. Hitchcock and Wm. G. Sloan.

The Concrete Products Company, Elk River, Minn., is reported to put in a factory in Devils Lake, N. D.

The La Mar Pipe & Tile Company, Grand Rapids, Mich., has been recently incorporated for $200,000 and will build a cement tile and pipe factory on the property of the Grand Rapids Gravel Company at La Mar, Mich., to cost about $80,000 with machinery. N. H. Battjes is president and J. Kent Wilson, general manager.

Chain-Belt Changes

William C. Frye, for seven years president of the Chain Belt Company, Milwaukee, has retired from active participation in its affairs and has been succeeded by C. R. Messinger, vice-president and general maanger since 1917. Mr. Frye is retiring after an active association with the company for twenty-eight years. During this time he has occupied practically all the important executive positions and just previous to his election as president in 1915 was treasurer. Mr. Messinger, who succeeds Mr. Frye, became associated with the Chain Belt Company in 1917 after eight years as general manager of the Sivyer Steel Casting Company. He is also president of the Interstate Drop Forge Company, vice-president of the Sivyer Steel Casting Company, vice-president of the Federal Malleable Company, all of Milwaukee, a director in the Nugent Steel Casting Company of Chicago and the First Wisconsin National Bank of Milwaukee. During the term 1922-23 Mr. Messinger was president of the American Foundrymen's Association and is also prominent in the affairs of the American Malleable Castings Association.

P. K. DeVoe, city engineer of Creston, Iowa, under date of July 3, 1923, writes: Bids will be received until 8 P. M., July 19, 1923, by Bert Tallman, city clerk, for the construction of 27,000 feet of curbing, 34,000 yards of paving and 9,500 yards of surfacing. Bids will be considered on the various classifications of concrete, asphaltic concrete, sheet asphalt and brick.

Certified check of $1,000 on responsible bank.

Plans, specifications and bidding blanks at the office of the city engineer.

The Universal Concrete Machinery Co., Peoria, Illinois, formerly a partnership, has been incorporated as the Universal Tamping Machine Co. with a capital stock of $50,000. The principal stockholders in the new incorporation are: Charles S. Emert, president and general manager; W. H. Janssen, secretary-treasurer; B. J. Lange, vice-president and Thomas W. Noble, member of board of directors. A contract has been let for the construction of a new and larger factory which will enable the company to properly care for its rapidly expanding business.

Quarry, Sand and Gravel Items

The Cajon Lime Products Company, San Bernardino, Cal., writes us it contemplates erecting a power house in connection with its proposed plant near Camp Cajon to cost $225,000 with machinery. O. E. Bricker and W. F. Warner, Riverside, Cal., are officers.

The Jefferson Highway Granite Company, Sauk Rapids, Minn., has been recently incorporated for $200,000 by E. F. and H. Przrborowski.

The Astoria Crushed Rock Company, Astoria, Ore., has increased its capital stock from $3,600 to $36,000.

The United States Gypsum Company, 205 W. Monroe Street, Chicago, Ill., has secured a permit to do business in Austin, Tex.

The Consolidated Granite Company, Columbia, S. C., has been recently incorporated with a capital of $50,000 by C. J. Niggel, president; A. Monlinaroli, secretary.

The Certain-teed Products Corporation, 100 E. 42nd Street, New York, N. Y., writes us as follows: "We are contemplating the erection of a plaster plant at Grand Rapids, Mich., to replace the plant at that point which burned down during March. This plant will probably contain two 12-ft. kettles with all necessary crushing, conveying, grinding, mixing and sacking machinery.

The Little River Limestone Corporation, Roanoke, Va., has been recently incorporated with a capital of $200,000 by E. W. Poindexter, president, and D. A. Kuyk, secretary.

The Woodstock Granite Quarry Company, Towson, Baltimore, Md., has been recently incorporated with a capital of $50,000 by Thos. J. Murray, Wm. J. Peach and Edward H. Burke.

The National Gypsum Products Company, Santa Fe, N. M., has been recently incorporated with a capital of $750,000 by E. F. Hoegerman, S. C. Rundle and H. F. Irvin of Los Angeles, Cal.; P. M. Holaday, Tacoma, Wash., and J. E. Fetz, Alamagordo, N. M.

The Crescent Wall Plaster Company, 816 Howard Avenue, New Orleans, La., writes us that it wants prices and catalogs on friction clutches, canvas belting, revolving screens, fire brick, elevator buckets, spur gear speed reducers, sprocket wheels, pulsating screens, motors, belt conveyors, rubber belting, wagon loaders, car unloaders, gears and dryers.

Seymour Trap Rock Company, Ansonia, Conn., operates a quarry with a daily capacity of 150 tons. Operates one Farrell crusher, a steam shovel and steam drills. Writes us as follows: "We intend to increase the capacity of our plant within the next six months by installing more crushers, air drills, quarry cars, motor trucks, rubber belting, wagon loaders, steam shovel, compressor, boiler and scale."

Aquia Creek Quarries Corporation, Fredericksburg, Va., has been recently incorporated to operate sandstone quarries in this section and will install a complete mining plant, industrial railroad, etc., at its local properties, estimated to cost $55,000.

The Basin Quarries, Inc., Portland, Maine, recently organized with a capital of $100,000, has plans under way for the erection of a new feldspar, quartz and mica plant, with pulverizing, screening and grinding departments, estimated to cost $50,000 with machinery. Daily capacity will be thirty tons. Joseph F. Perry, president; Frank L. Marston, vice-president.

The Waukesha Washed Sand & Gravel Company, 204 Grand Avenue, Milwaukee, Wis., has taken a long term lease on the sand and gravel lands of H. J. Liftsgordon in the town of Burke, Wis., and contemplates investing $50,000 for equipment such as washing, crushing, conveying and handling machinery, all to be electrically operated. George Brew is president and general manager.

The Northwestern Sand & Gravel Company, E. H. Lowderbaugh, manager, Des Moines, Iowa, is having plans drawn for a $100,000 stone crushing plant to be located near Quarry, Iowa.

The Neches Sand Company, Beaumont, Tex., has been recently incorporated with a capital of $28,000 by Michael Sotrehaug, Ed McCarthy, Jr., and Peter Boade.

The St. Charles Sand & Material Company, St. Charles, Mo., is dredging sand from Missouri River and has a daily capacity of 300 cubic yards. Writes us that it operates a dredge and clam shell for digging and loading material. Wants prices and catalogs on belt conveyors and wagon loaders.

The Glacial Sand & Gravel Company, Zanesville, Ohio, operates a sand and gravel pit with a daily capacity of 250 tons. Operates Flory hoist and Owens buckets. Contemplates installing equipment for loading and digging material.

The Federal Sand & Gravel Company, Saginaw, Mich., has recently purchased the plant of the Campbell Gravel Company of Roscommon, Mich.

The Sanitary Creek Rock & Gravel Company, Olive, Orange county, Cal., has recently been incorporated with a capital of $50,000.

The Lake Sand Corporation, 133 West Washington St., Chicago, Ill., has been incorporated with a capital of $150,000 by M. Hausler, M. G. Hausler, J. T. McDonough, P. C. Darby and M. D. Wilson.

The Winchester Gravel Company, Winchester, Ind., has been recently incorporated for $35,000 by E. M. Clark, W. H. Fudge, E. Clark and A. E. Fudge.

The Superior Rock Products Company, Marquette, Mich., has been recently incorporated with a capital of $2,500.

The Barry Sand Company, Saginaw, Mich., has been recently incorporated with a capital of $25,000.

The Chemical Construction Company of Charlotte, N. C., Peter S. Gilchrist, president, has plans under way for the construction of a new phosphate plant along the Hillsborough River at Tampa, Fla. The plant, with machinery, will cost over $1,000,000. The Tampa Board of Trade is interested in the project.

The North State Feldspar Corporation, Micaville, N. C., has been recently incorporated with a capital of $100,000 by B. B. Silver, T. S. Huges and R. C. Hill.

The Western Lime & Cement Company, Milwaukee, Wis., will operate its lime kilns at West Kewaunee after being shut down for a few years. Much of the machinery was removed at that time and new machinery will be installed for crushing stone for road work.

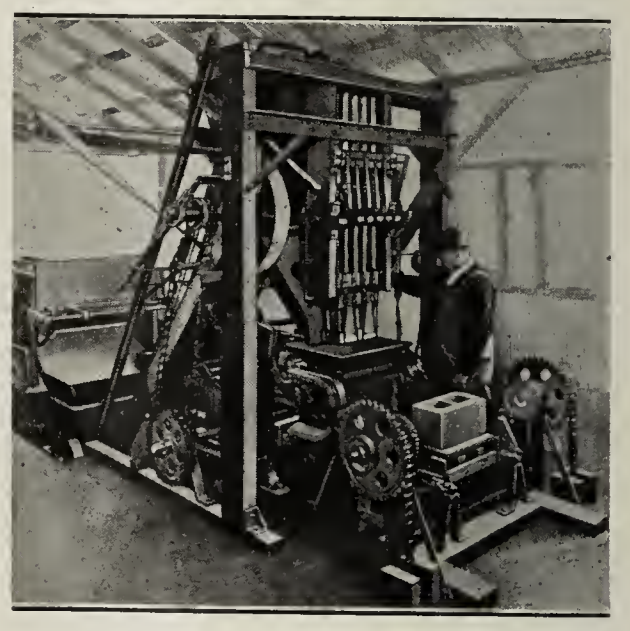
The Pacific Limestone Products Company, Oakland, Cal., has recently purchased ten acres of agricultural lime land at Santa Cruz and will go into production.

The Rock River Sand & Gravel Company, Dixon, Ill., H. Franks, president, E, Lloyd, secretary, is erecting a $10,000 plant on Rock River, with a daily capacity of 300 cubic yards. The plant will be in operation shortly.

The Ford Motor Co., Detroit, Mich., has recently purchased the property of the Garnet Grit Company of Danbury, N. H., and is proposing to install a modern quarry plant, with separating, pulverizing and crushing mills. The estimated cost of the new plant is $100,000.

The Bodega Materials Company, Aldridge, Ill. (recently incorporated), has purchased two crushers from the Allis Chalmers Mfg. Co.'s branch office at St. Louis, Mo. They are seventy and ninety-ton gyratory crushers.

The W. H. Loomis Talc Company, Gouverneur, N. Y., is perfecting plans for the installation of hoisting, conveying and other machinery at its plant.



The Roll-Over machine built by the Ideal Machinery Company of Cincinnati, showing the block after it is stripped.

The Orton & Steinbrenner Company, 608 S. Dearborn St., Chicago, Ill., manufacturers of locomotive cranes, dipper shovels and grab buckets, announces a reorganization of the company and the election of the following officers:

P. A. Orton, president and general manager; E. B. Ayers, vice president; Herbert Mertz, secretary and sales manager; Harry Shaffer, treasurer and purchasing agent; G. L. Niederst, chief engineer; Alex Orton, works manager.

No change in the management, control or policy has been made, nor is any contemplated. The reorganization is occasioned only by the resignation of H. G. Steinbrenner as president and the disposal of his interest in the company.

The Orton & Steinbrenner Company was organized in 1906; its factory and works are located in Huntington, Indiana, and main offices in Chicago, Ill., with representatives in all the principal cities of the United States and Canada.

Cement
and
Engineering News

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A Business Opportunity for Business Men

To the Concrete Manufacturers a Limitless Field Is Open—Room in America for Thousands of Prosperous and Substantial Concrete Product Businesses

If any one development may be said to be a particular mark of this third decade of the twentieth century it is standardization. In every line and in every particular of every line, the trend is toward standard construction. The one influence which tends to discourage this development is the human characteristic—nowhere more highly developed than among Americans—of a love of variety. No one wants to inhabit a home which is an exact replica, line for line and measure for measure, of a number of other human habitations. Every woman's hat must be in the mode, but must not be a duplicate of some other woman's cranial adornment. The demand therefore, would seem to be for that apparently impossible combination—standardization and interchangeability, with variety.

In no other range of human endeavor can this seemingly impossible and contradictory demand be more completely met than in the construction industry with the utilization of precast concrete, more commonly referred to as concrete products. Already used in a multitude of instances and throughout the length and breadth of the country, a merely cursory examination will show that this particular phase of industrial development has been only scratched on the surface and that conspicuous success awaits not only one nor a few men but hundreds who will study and avail themselves of the opportunity which the situation presents.

It is impossible to compile a complete list of the uses and possible uses of concrete products. Were this writer or any other to accomplish his best along that line the merest tyro, after reading the compilation, could probably suggest numerous additions. This—for the reason that the range of uses is unlimited, the scope of human ingenuity being the only bar to a development of possibilities. It shall not be in the scope of this article to present any lengthy list. It will rather, in a general way, attempt to open up to the reader a vista of the virgin field which awaits and invites his energy.

First we will define "concrete products." All those objects or pieces which are made out of concrete at a factory for use at some other point are known as "concrete products." Of these, the simplest form is the concrete block. The present range of manufacture runs from the ordinary block to fence-posts, telegraph and lighting poles, sewer pipe and so on, up to highly decorative pieces such as grave markers, sun dials and corner stones. It is practically a fact that anything that is wanted can be produced in the form of pre-cast concrete. Its strength, long life and convenience in handling are sufficiently well known as to render any demonstration here unnecessary. The fact that the industry is still in embryo and that its possibilities are understood by but a few render a discussion of that phase of it decidedly apropos.

There are today hundreds of concrete block makers all over the country. Almost every town of any size has its small plant and the most of them are making but a few standard styles and sizes of building blocks and taking such business as comes to them. Some conspicuously successful concerns are making everything they can find a demand for, and are consistently going out and "scaring up" new demands. Owing to the fact that concrete products are very heavy, each concern's activity is limited by freight rates in a two or three hundred mile circle, in the average case, but the possibilities of the business are so enormous that if any organization fully developed all the potential business in its 250 mile circle, it would grow to enormous size and constant prosperity in supplying it.

We will consider a hypothetical case of a concrete block maker in a town of 40,000, located in an agricultural district and with several towns of from 2,000 to 15,000 population within fifty miles. Included in his 250 mile circle are many other places, some large and some small. We will attempt to foresee the development of this concern's business, if its guiding heads were go-getters.

The first thing to look to is, naturally, the concrete building block business. This is by no means limited, as many would suppose, to supplying material for small homes, garages, and similar structures, but is adaptable for almost every conceivable class of structure. Cases are numerous throughout the United States where large and truly beautiful structures of every type have been constructed of concrete blocks, and no prospect should be overlooked. The points which may be advanced as favoring block construction over any other method are numerous; e. g., greater strength; greater perma-

Concrete brick ready for market. This plant h as a national reputation for an excellent product.

nence; absolute fireproofing; more massive appearance where desired; adaptability, that is, the ability to get exactly the size, shape and color tint of block that is desired; lower cost in material; lower rates of insurance; lower cost in handling; these are but a few of the arguments that can be advanced. Numerous examples can be cited where large structures have been built of concrete blocks, ranging from the beautiful and imposing million dollar court house of Westchester County in White Plains, N. Y., down to the small but impressive structure erected by the Mechanics Savings Bank, in Rochester, N. Y.

The country is dotted with structures of this kind, and there is only one reason why they are not more numerous—the makers of concrete blocks have been content with small business and to leave the big buildings to their competitors. The maker of concrete products who desires to actively go after business will keep in touch with every proposed structure in his territory, regardless of its size, and make a sincere effort to get the business. In many cases an efficient and thoroughly honest liaison can be established with local architects to the effect that proper recommendations may be made by them to prospective builders. All that is needed is to make a fair presentation of the qualities of the concrete block, and the builders' self interest will assure a fair share of the business.

Certain particular types of buildings are peculiarly adapted to concrete block construction, and prospective builders in these classes should be most closely watched. Garages, both large and small, are best when thus constructed. Small cottages and bungalows, barns, motion picture theaters, warehouses, stores and churches are particularly fertile fields for the concrete block salesman. A review of the field will show the brick maker and lumber man actively after this type of business in which the concrete block has an excellent chance if properly presented. It is a case where success is measured almost exactly by the amount of effort exerted.

In any territory such has been described above the farmer trade is the predominant factor in most lines of trade. To the concrete products maker it occupies a similarly important position. The uses of precast concrete on the farm are endless and the maker who is out for business will analyze this field closely in an effort to cash in on its possibilities. The first and most obvious line of attack is on fence posts. These can be made in a variety of sizes and styles, and can be stocked in reasonable quantities. A permanent and active campaign for business can be inaugurated, as every farmer who has a fence with wood posts is a prospect. Some day his wood fence will have to be replaced; every day some farmer's fence has to be replaced; and there is the concrete man's chance. He can demonstrate a reasonable first cost and practically eternal life to the post. Every post he sells is a bid for further business and, in a short time, his concrete post installations will become the badge of the progressive farmer. One has only to figure the lineal footage of line fence in his territory to sense the possibilities in this line.

Precast concrete cribbing for embankments provide a profitable line.

Then come the other farmer uses. Blocks for silos, which can endure any wind and any load and last for endless generations; blocks for barns, granaries and houses; tile for the fields; pipe for a water or sewer system; posts for grape arbors; culverts for drainage systems; these are but a few of the places where pre-cast concrete can be used on the farm. Properly presented, the maker of concrete products is the farmer's best friend, for what he sells is reasonable in cost and will last as long as any of the present generation and much longer. His service makes for economy and efficiency on the farm and should be recognized as a power for public good.

In the municipality in which the cement block maker is located and in the surrounding towns in his natural territory certain public works are always under way. Of this work he should get a share for his product is economical and lasting. To specify, in any sewer work up to sewers of 42 inches in diameter, precast concrete pipe is ideal. It is uniform in size, smooth in texture, can be made impervious to moisture, and is as easily laid and made water-proof at the joints as any other kind of pipe. Any town council, a board of public works cannot fail to give consideration to the concrete pipe. Its use in many communities demonstrates its worth.

Every town, sooner or later, considers an ornamental lighting system. Here the concrete man is in his element. In no other material can posts of equal beauty and strength be made at an equal cost. Active campaigning among business men in the various towns can often initiate action that will result in heavy orders. These developments are contagious. When one of a group of towns installs a "Great White Way" or a lighted boulevard, others are prone to fall in line. It is a feature of the concrete products business that possesses unlimited possibilities.

Street markers are another opportunity. Every town and city uses some, and those of less permanent type than concrete are soon unsightly and unsatisfactory. An initial installation is a breeder of future business. County highway departments can also often be interested in road markers and direction posts, as, also, can automobile associations and chambers of commerce. Every city, every park, every cemetery, every private estate and every public service corporation is a prospect for some one of the innumerable forms of concrete posts that can be easily and profitably made.

The electric rail lines in and between the various towns are particularly good prospects. They all need trolley poles. Wood poles rot or burn off every few years, or are broken by sleet and wind. Concrete poles are permanent. With the recent high price of wood poles, where only moderate sized pieces cost upwards of twenty dollars, the concrete pole has easy competition. Each year more and more of the millions of poles which are required in electric railway work are coming from the concrete products plant. Nor do the possibilities of the traction line as a customer end here. Telephone boxes such as are used along the right-of-way, are nearest ideal when made of concrete. Suburban and way-side stations and shelters are best when so constructed. Mile posts, highway warning signs, and cattle guards can all be of pre-

Safety considerations dictate indestructible precast concrete crossing slabs.

Great retail stores find conerete products a profitable department.

east conerete. Bumping posts at terminals are best when made of eonerete. Twenty-five million ties are used each year by eleetrie roads, and some of them in eonstantly growing number, are eonerete. Crossing slabs, to assist highway traffic over rail erossings, add permanenee and safety at the point where public interest demands them and their economy is an eye opener to road superintendents. The possibilities of pre-east concrete in interurban and eity rail work are endless. The maker ean profitably keep his eyes open and his eontact with the road exeeutives eonstant.

Every eommunity has one or more coal yards, where fuel is retailed for domestie use. The greatest problem of the eoal dealer is to procure labor to unload his ears and load his wagons and trucks, and paying for this labor is one of his great items of expense. The eement produets man can show him how, by the installation of a modern cement bloek or stave silo plant with a eonveyor, he can save fifty eents on every ton he handles. This is a definite saving and ean be demonstrated to the satisfaetion of any doubter. A sineere inquiry along this line usually results in a sale running into the thousands of dollars.

The power and light eompanies maintain sub-stations at points distant from their plants. Owing to their peculiar insulation qualities, eement bloeks are the best known material for this eonstruetion. The same quality renders them partieularly good for the construetion of any building, large or small, designed to house eleetrieal equipment. All eompanies maintaining wire systems have need, occasionally, to plaee wires underground. For this purpose no conduit, or pipe, is better than pre-east eoncrete. This is especially true of lines earrying high voltages.

The private estate has beeome a large user of eonerete produets. Not only do they use ornamental light and fenee posts, but eorner markers, lawn benches, fountains, bird-baths, sun dials and flower boxes are rapidly growing in popularity. The great voeational institute maintained by the Loyal Order of Moose at Mooseheart, Ill., has made wonderful development along this line. So great has beeome its popularity that great retail stores, like Marshall Field in Chieago, and Wanamaker, in Philadelphia, maintain display rooms of these various artieles and earry supplies in stoek. The elever use of the tinting possibilities of cement render the possible variety in sueh a line endless. Exhibits at fairs have been found to stimulate sales of these articles.

Culvert eonstruction is another possibility. Every railroad, both steam and eleetrie, every highway department, every private estate, every eemetery, has use for eulverts. The best engineering praetiee approves pre-cast eoncrete for this purpose and aetive sales effort ean locate many prospeets who ean be eonverted into customers. This market goes hand in hand with that for sewers, mentioned in a previous paragraph.

To proeeed with this discussion at greater length would be tedious. Further possibilities are obvious to all. It is sufficient to generalize in a listing of structural units, including concrete bloek and brieks, for all manner of buildings; exterior building trim, such as sills, lintels, corniee bloeks, eolumns, balustrades, poreh rail, etc.; pipe and tile, for water lines, sewer lines, drainage, irrigation, wire eonduit, pressure lines and culverts; posts and poles, for fencing, lighting, telephones and telegraph, railway signals, vineyard posts, mail box posts, mile posts and road markers; ornamental objeets, ineluding park and garden benches, vases and urns, fountains, sun dials, statuary, bird baths and pedestals; miscellaneous objeets, sueh as burial vaults, tombstones and grave markers, sign posts, roofing tile, railroad ties, garbage boxes, laundry tubs, ineinerators, meter boxes and the like. All of these and many more go to make up the legitimate business of the maker of eement produets.

The meaning of it all is elear. The man who wishes to remain in the eement bloek business exclusively, and take only sueh business as may intrude, will get along from year to year in very medioere fashion. The one who avails himself of the limitless possibilities offered by the genius of the eement maehinery makers, who develops and expands his business as rapidly as the traffie will permit, and who goes out and "gets the business" will rapidly develop into a big business man, and a real benefit to his eommunity. So great are the possibilities of this business that, if the area of this nation were divided in plats measuring 100 miles on a side, there is room for a really large and suceessful eonerete products business in the center of every one, barring only the most sparsely populated regions.

It is the one outstanding phase of Ameriean business that seems to be erying for men of initiative and pep.

Concrete burial vaults are another profitable product.

Cement Wages

WASHINGTON, July 28.—Employment figures of the Bureau of Labor Statistics of the Department of Labor show inereased aetivity in the eement industry in June as compared with May.

The number on the weekly pay roll in 72 eement plants in June was 20,914 as eompared with 20,628 in May, or an inerease of 1.4 per cent. The amount of the pay roll in one week in June in these 72 plants was $592,973 as eompared with $578,450 in May, or an inerease of 2.5 per cent. The average per capita earnings in the eement industry increased by 1.1 per eent in June over May.

Out of 63 eement plants on whieh data was obtained relative to full and part time operation 97 per eent were operating on a full-time basis in June while three per cent were operating on a part-time basis. None were idle.

Ten plants reported wage inereases in June. The inereases amounted to 4, 5 and 25 per eent, or an average inerease of 11.2 per eent. The number of employees affected was 2,815, or 13.5 per cent of the total number of employees in the 72 eement plants. The wage inereases affected 62.6 per cent of employees in the particular establishments in which the increases were made.

Little Brothers to Mogul—

In no sense would it be amiss to say that one of the important factors in keeping cement manufacture abreast of the times, one of the sturdy reasons why cement has decreased in price while various other articles that come out of the earth have gone up, has been the industrial railway, and more specifically its power unit, the industrial locomotive.

At the outset let it be distinctly understood that the present writer has no brief to hold for—and no bone to pick with—any of the three general types of locomotives mentioned in this article; viz, steam, gas and electric dinkeys. All have their particular virtues. Each of these types of locomotives is just as important as the other, partisan enthusiasts to the contrary notwithstanding; and, when you get down to brass tacks, their different spheres of operation probably overlap to a lesser degree than prejudiced salesmen would have us believe. Each of them is emphatically efficient, when properly applied; and the proper application of power units depends on the purchaser in the last analysis—the engineer or whoever does the buying.

With this qualification. There is too much sell first and think afterwards in the placing of industrial locomotives. Of course, that criticism is true to a large extent of any branch of manufacture; but it is particularly true in this case, as investigation will bear out. When you enter the market as a prospective buyer of a steam, gas or electric dinkey, you are handed a set of specifications and a lot of photographs—and that's about all. Whereas, more pains should be taken in this line of selling than in most any other under the sun. Salesmen should exert every effort to *know the job,* know the details to be worked out under the circumstances, study the prospective installation with a view to diagnosing the real difficulties and then putting in the engine that will overcome the biggest part of them.

By the same token, buyers should be at equal pains to determine what they want to accomplish on a given job or in a given length of time, so that they won't buy a mogul when they need a power mite. If facts are too hard to get for a given set of conditions; if the right sort of information is too seldom available at the right time (and the present writer believes it decidedly is) that is largely the fault of those who make and sell industrial railway equipment. They should deal in facts as well as "iron mules," constructive ideas as well as specifications. And yet, with a few notable exceptions, the literature issued by concerns of this classification is vague, uninforming and confusing. Generally there isn't any to speak of at all. Not infrequently it runs to extravagance in the terms of its argument. For example: "The steam locomotive is also passing," says a manufacturer of gas dinkeys, in writing an epitaph over the horse and mule in quarry work. "It may have capacity but it lacks speed. It pounds out trackage, loses time in starting and stopping, introduces a cubersome and expensive fuel problem, and invites a multitude of leakages because of alkaline water. You cannot profitably combine weight and speed in short hauls." Part of that is bitter truth; but some of it, like the premature report of Mark Twain's death, is "greatly exaggerated."

Foreword

(Taken from the kind of advertising that is also literature.)

"Out of the earth come many things—almost without exception time increases their price. But the price of —— Portland Cement is actually less than it was thirty years ago.

"Originating in the quarry, it passes through eighty-five intricate manufacturing operations involving a high degree of technical and mechanical skill.

"Building problems have multiplied, with congested cities, heavy traffic, modern industry. But the one material that meets the greatest variety of building needs is today the cheapest of all products involving a complete process of manufacture."

In an article on labor saving devices, Floyd Parsons, an eminent writer on economic subjects, says: "The world has become a place of revolving wheels and the great need of the day is for energy to keep the wheels turning." Looking at present day industrial conditions in such a light as that, the makers of narrow gauge equipment would have more to do than picking flaws in the other fellow's product. They would see their locomotives as releasing energy, thereby helping to keep the wheels of industry turning. They would see their products as savers of property. And "everything that saves property saves labor and this not only releases workers for other essential employment but reduces costs all down the line."

As an example of more constructive literature, consider the following discussion of modern road-building. It was issued in highly readable form by another maker of gasoline locomotives:

"In looking over the engineering field of endeavor of the past few years, no advancement of methods, thoroughness of construction, and unity of purpose stands out as that of road building. The step from the gravel and cinder roads of yesterday to the concrete highways of today, has been accomplished, it appears, over night. It would appear as wilful disregard if we did not pay tribute to those engineers, both public and private, who are, by hard work, co-operation and determination, lifting the people of this country from the mud onto concrete, and we are glad that these roads, winding through and across the continent, will always stand as a monument to their skill.

At Railroad Delivery Point

"In road building, the main problem is to transport materials from the railroad receiving point to the mixer, and at the same time maintain cleanliness of materials and uniformity of delivery at the lowest cost. By far the most economical method yet devised is the industrial or narrow gauge railroad. It is not only economical but it has a flexibility which allows its adoption regardless of conditions. The materials carried in batch box cars, propelled by —— gasoline locomotives, arrive at the mixer clean, in the correct proportion, and with a continuity unobtainable by any other method.

"At the railroad point of delivery the materials are, as a rule, transferred to

A Birmingham Rail Locomotive Company dinkey serving a Bucyrus steam shovel at the Whiting Dam in North Carolina.

Industrial Locomotives for Local Transportation an Important Item in the Industry

elevated hoppers by a locomotive crane. The industrial track running under these hoppers allows almost instantaneous transfer to the batch boxes beneath, measuring chutes allowing sufficient sand, gravel and cement, where bulk cement is used, to go into each box, so that further measuring at the mixer is avoided. As a rule, one locomotive with a low or removed cab is held to serve the hoppers, thus avoiding excessive elevation of the hopper structure. At some points the railroad cars are unloaded from a trestle with the hoppers beneath. At other points the loading is done from the ground level, the track being laid in a tunnel beneath the hoppers or loading platform. In any case the batch box cars are readily and accurately loaded. When the cement is stored in bags, the train is run alongside the warehouse and the proper amount of cement added to each box. In many installations the industrial tracks parallel the railroad tracks and the gasoline locomotives are often used to switch the railroad cars, a rope or pole being employed to make the connection.

"The track employed is usually a 20-pound steel rail, put up in 15-foot sections, with seven pressed steel ties to the section. It is readily laid and easily moved, and can be laid from the railroad delivery point to the junction with the highway with very little grading. At convenient points passing tracks may be installed, allowing the use of two or more trains. At intersections with interurban or railroad tracks, removable sections are laid and removed as soon as the train has passed, so as not to obstruct such interurban or railroad track. Where permission cannot be obtained for crossing such tracks, the industrial track can be laid through some culvert and the train with cab removed can run under such tracks. In fact, almost any condition can be easily taken care of.

At the Mixer

"At the mixer the real advantage of using industrial track equipment is most apparent. The track is carried not in center of the road, but on the shoulder, allowing the work of subgrading, fine grading, and rolling ahead of the mixer to be carried on without interruption or breaking down of the subgrade, as is always done where truck haulage is used. After wet weather material can be hauled to the mixer as soon as the subgrade is dry enough for cement and a good deal of valuable time saved. With truck haulage it is impossible to get to the mixer until the subgrade and other adjoining roads have dried out sufficiently to hold the trucks.

"At the rear of the mixer the tamping and finishing can be done without interference, and the cement can be covered as soon as it is dry. This is of very marked advantage in road building.

"When the train loaded with batch boxes arrives at the mixer, each batch box is lifted from the car and dumped into the mixer as it is needed and the empty box dropped back in place. The train is moved along a car length at a time, until all of the material has been disposed of. The fact that the materials do not touch the ground from the time they are received at the railroad point until they are poured as mixed concrete, is an argument in favor of this system that is hard to overcome, especially in states in which the road departments specify the use of washed materials.

Incidentally, that is the most comprehensive description of the function and operation of an industrial railway in modern road building that has been published to date, so far as the present researcher could ascertain. It is the sort of literature that instructs while it sells.

Costs Hard to Determine

After digging into all the literature obtainable from presumably all the companies in the field and interviewing responsible men at all three points of the steam-gas-juice triangle, the writer has reached two other conclusions: (1) No table of comparative costs can be arrived at as yet because costs in the industrial railroading game are too much the prey of conditions. Moreover, the haul, the grade, the fuel, the weight of the load, etc., vary so with different jobs that costs from finished jobs would be of scant service elsewhere, if they were available. (2) That no fair comparison of the performing qualities of these three types of locomotives can be had because of varying circumstances again and because literally no users of industrial railway equipment have had the time, the money, or the opportunity to make economy tests under parallel conditions.

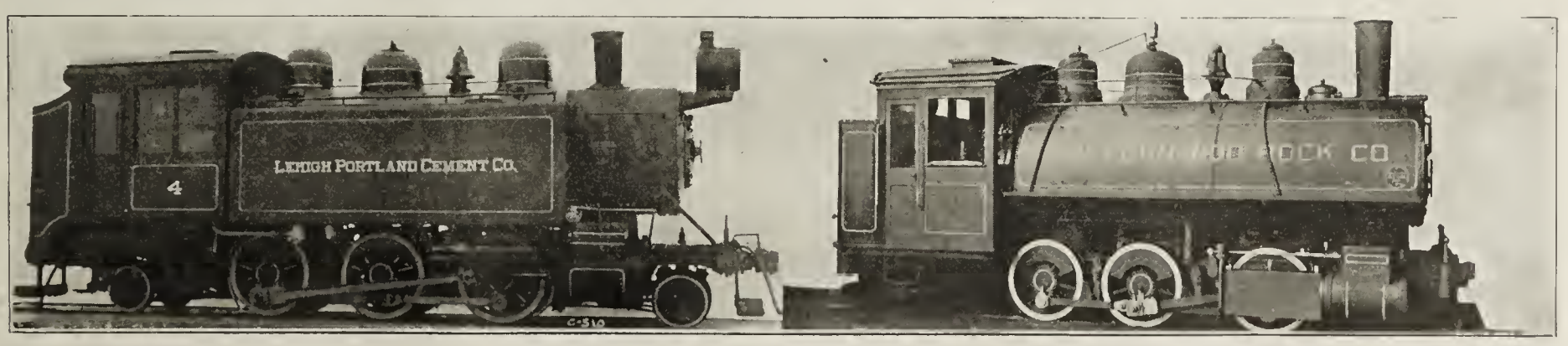
Then there's the human element.

The present writer interviewed a nationally known estimator. He said: "On any road where the grade is not prohibitive, road builders cannot afford anything else than an industrial railway." He favored gasoline locomotives and had proved to his own satisfaction that the line of economy falls somewhere be-

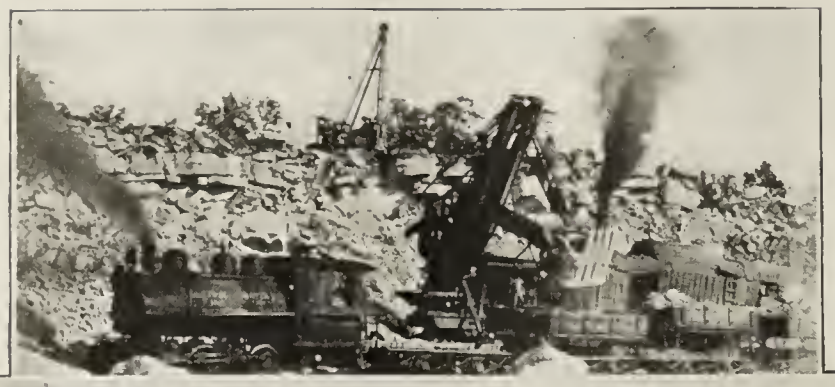
A Heisler geared locomotive. In quarry work there are steep grades between the quarry face and the crusher.

Another marked advantage is the absence of materials left along the side of the highway at finished points, quite a loss in itself, at times amounting to 10 per cent to 15 per cent.

"The ease of operation, the practicability in all kinds of weather, the low cost per ton mile, places the gasoline locomotive in a logical lead over other methods of conveying materials for road building. Should the reader be interested, we would, on solicitation, be only too glad to analyze your particular conditions, wholly without charge or obligation."



At the left: A locomotive built by the American Locomotive Company for the Lehigh Portland Cement Company. This is a standard gauge and weighs about sixty-eight tons. At the right: A locomotive built by the Baldwin Locomotive Works for the San Fernando Rock Company. This weighs about thirty tons.



At the top left a Davenport locomotive at the Greenville Gravel & Stone Company's lower quarry, Williford, Ark. Right: A Porter locomotive at the plant of the Ohio Marble Company, Sandusky, Ohio.

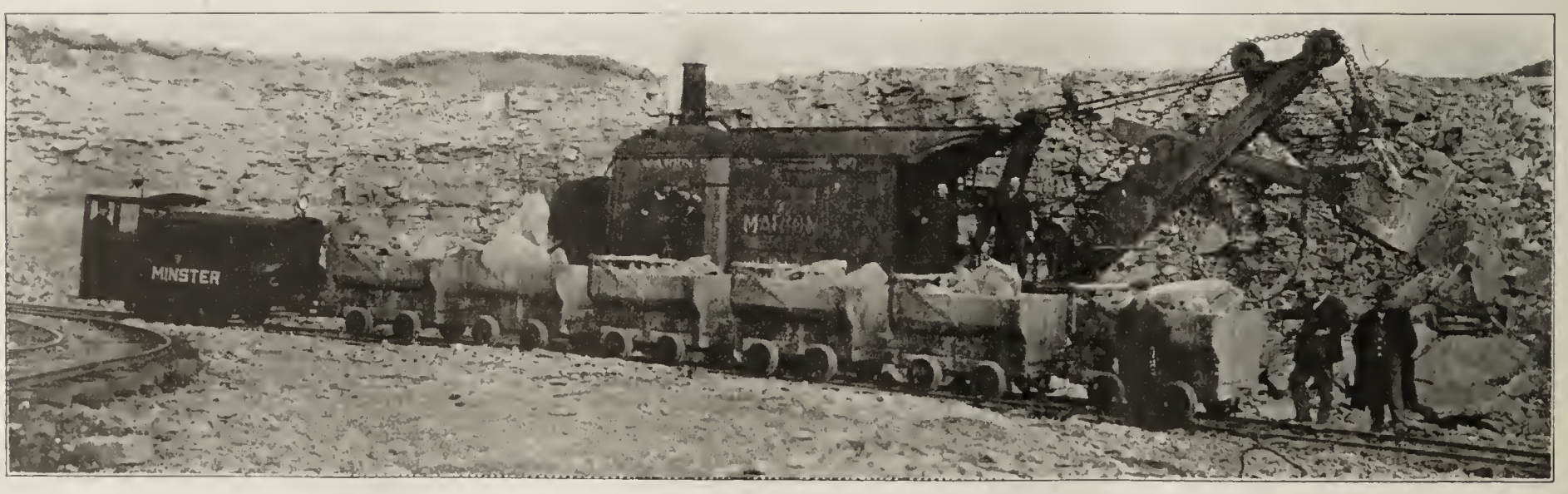
A Vulcan Iron Works locomotive at a stripping operation in Hazelton, Pa. Bottom: A Lima Locomotive Company Shay locomotive working for the Julius Freidrich Company, contractors Rochester, N. Y.

tween a 2½ and a 4 per cent grade in industrial haulage. Contrary to a contractor who said that labor-saving with this type of equipment was not conspicuous and that the talk of being able to resume sooner after a rain than with trucks was "the bunk" ("because you have to wait for the operation to dry, anyway"), he could show a substantial saving of labor and had found it possible to work much sooner after a rain than when trucks were used. A wait of two days was frequently necessary with trucks, he said; whereas you could go ahead almost immediately with an industrial railway on the job. No trouble about the operation drying if you were up-to-date, he said. This expert had delved into the whole matter deep enough to say, "If you can haul fifteen cars on your grade, three locomotives will handle you up to three miles, and four up to six miles. In other words, a new power unit every additional three miles."

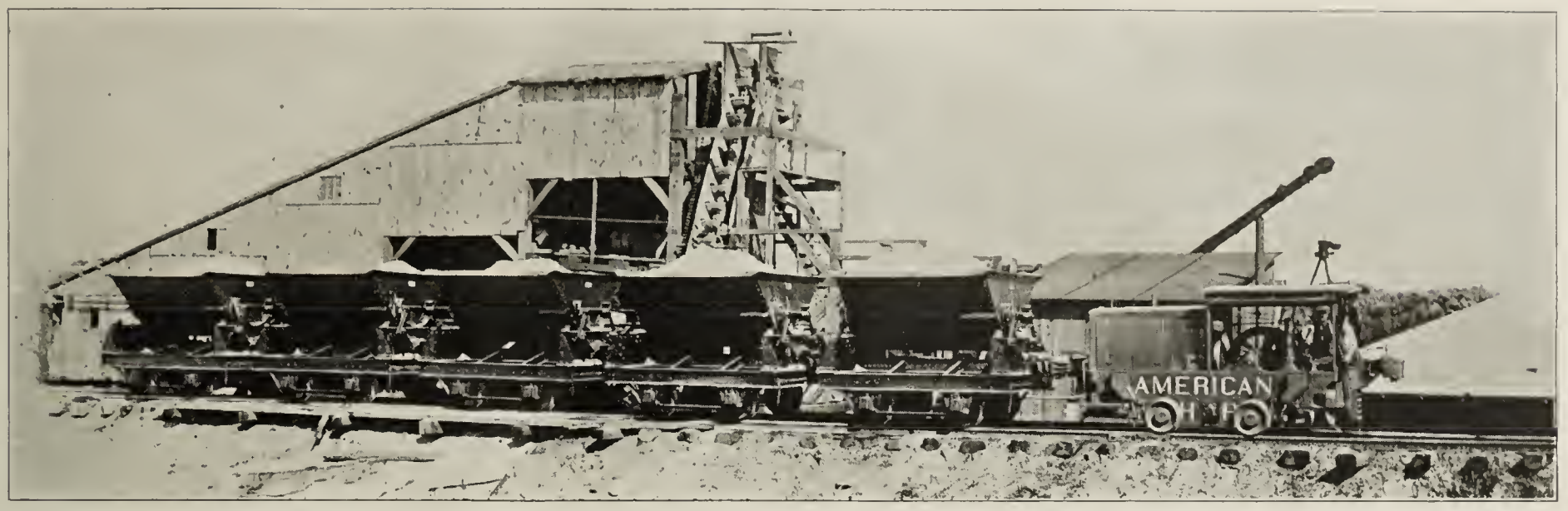
Speaking of laying out an industrial railway for road-building, he emphasized the need of building it all around the easiest material points. He described a system of narrow gauge industrial railway as ideal for road-making and went so far as to call it adapted to any job where concrete is being laid extensively. Besides a reduced overhead for labor, there was a saving in haulage costs and time to be considered, better regulation of time and labor at the source of material and at the mixer, all-around increased efficiency and speed. As for maintenance, it costs just so much money and so many men to keep the roads up and the ruts down with trucks, he said, so why not solve the transportation problem once and for all with rail service?

Before taking up the different types of industrial locomotives in detail, let us repeat that the question of which is the best for the greatest number of purposes is controversial to a high degree. In fact, it is incapable of decision at this stage of the game, in our opinion at least. We propose, therefore, to conclude this article by setting down as many of the virtues, usages and advantages of each type as could be uncovered. The reader can take them for what they are worth to him.

Incidentally, the following resume of a discussion that occurred at the annual dinner of the New England Railroad Club last January over the efficiency of the regulation railway locomotive will



An Industrial Equipment Company Minster gasoline locomotive serving a Marion steam shovel. The illustration shows a compact transportation unit.



An American Gas-o-motive built by the Hadfield-Penfield Steel Company and operating at a plant of the Cape May Sand Company, Cape May, N. J. This locomotive handled five cars loaded to sixty tons up a four per cent grade from a standing start.

serve to show that, even at this late date, there is nothing unusual about the subject of motive power and the best means of getting it being more controversial than anything else.

Taking for the title of his discourse the interrogation "Is the Steam Locomotive Out of Date?" L. G. Coleman, assistant general manager of the Boston & Maine Railroad, said: "I think that there will be no dissent to the statement that the steam locomotive is probably the most uneconomical and unsatisfactory machine in industry. . . . We have made enormous improvements that, granting its inherent weakness, have very much increased its efficiency as far as a power producer is concerned, but these same improvements have so increased the cost and difficulty of maintenance that the time lost in terminals practically wipes out the savings due to fuel economy obtained by modern devices and increased power units."

He explained that "the inherent weakness of the steam locomotive is its boiler." He summarized the delays incidental to the use of a steam boiler as "washouts, hydrostatic tests, repairs due to leakage, fire box and front end maintenance, delay on ash pits and at coaling stations and the extra expense of maintaining ash pits, coaling plants, water stations and the delay incidental to taking water en route." He had submitted his opinions to provoke discussion, he said, and he got it, according to the minutes of the meeting.

Steam Locomotive Efficient

The mechanical engineer of the Boston & Albany railroad, for example, replied: "Mr. Coleman attributes the low efficiency of the (steam) locomotive to weakness of the boiler. As a matter of fact, the efficiency of a locomotive boiler and superheater varies from 60 to 80 per cent, depending on the rate of combustion, so that the low efficiency of the locomotive as a whole should not be attributed to the steam boiler. The chief inspector at Washington reported June 30, 1921, that the percentage of defects for locomotive boilers and their appurtenances was only 19 per cent of the total defects."

Another speaker said: "I am convinced that the plainer the locomotive, the simpler its construction, the more you get out of it and I believe economy." Still another said he had found on investigating the efficiency of the so-termed "inherent weakness of the steam locomotive" that it varies from 85 per cent efficiency at 100 per cent rating and 65 per cent at 350 per cent rating. A representative of the Baldwin locomotive works replied to Mr. Coleman in part as follows: "Anyone following the development of the steam locomotive and devoting some time to seeking its successor will undoubtedly be impressed by the fact that, without exception, the steam locomotive of today is the most wonderful power plant ever developed. When you consider the horsepower developed by a steam locomotive, which must be built within very restricted limits of height, width and weight, a machine that is self-contained to the extent that it carries its own foundation, power-house, fuel and water supply and you have a wonderful machine indeed. One's respect for the steam locomotive will only increase by comparison with any substitute so far produced. The greatest obstacle to finding a successful substitute for the steam locomotive is the steam locomotive itself. It has not stood, and will not stand, still in order that any substitute may have an opportunity to catch up with it."

A Whitcomb locomotive hauling batch cars. Note the arrangement allowing the batch cars to be loaded underneath the loading platform.

Sic semper with sweeping statements.

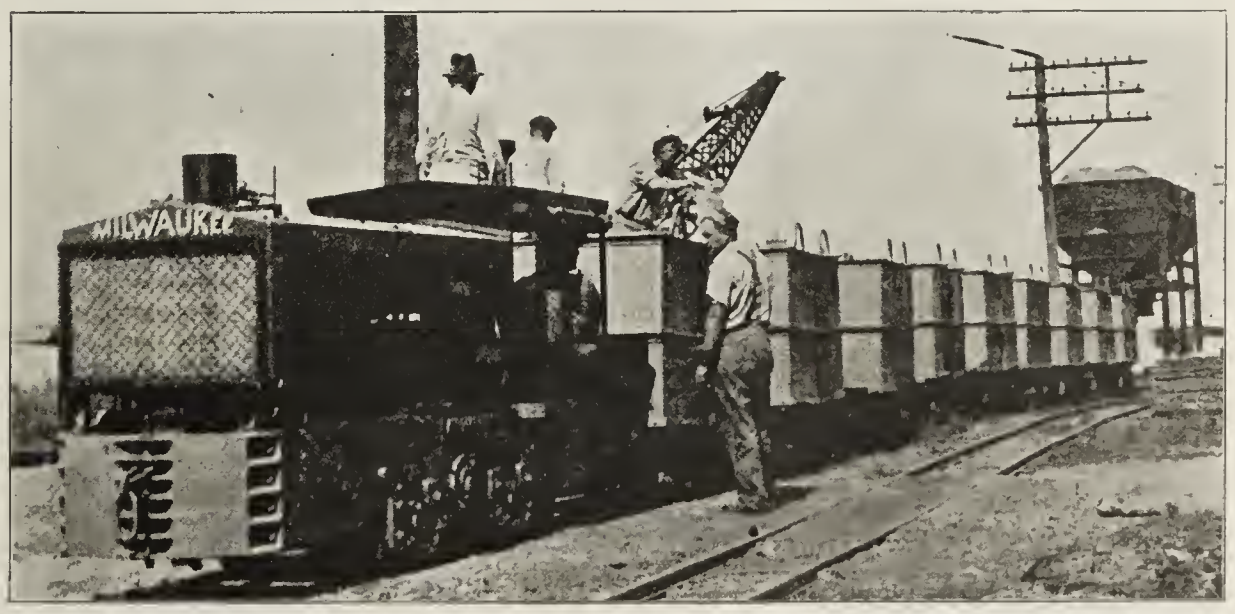
With regard to the steam dinkey in industrial haulage. One of the manufacturers of these says rightly that "nobody needs to be advised to get a locomotive that is strong and rugged." And adds something that is worthy of a paragraph by itself:

"An industrial locomotive must be reliable."

Strength—all of it possible—must be put where the strains come, is his logical argument. "But the manufacturer is always up against the limit of weight; an engine of certain size and weight cannot be strengthened in one part without being weakened in another. That is where the manufacturer with the simplest design has the edge. Having fewer parts in his machine, he can make the parts stronger and with the same total weight he can give better provision against breakage and longer wear." Few will argue that the steam dinkey is not simple in design.

The Flexibility of Locomotives

This maker states that the next thing to look for in an industrial locomotive is flexibility of trucks. "There are nearly always sharp curves in industrial hauling; and the engine does not pull its load over a roadway that some engi-



A six ton Milwaukee gasoline locomotive built by the Milwaukee Locomotive Manufacturing Company, hauling batch cars from the loading bins on a road job.

An Adamson-Fordson gasoline locomotive using Ford tractor motor on a stone hauling job.

neer has laid out with a tangent as close as the grades will permit. The industrial locomotive has to haul around twists and turns; and, besides, the track is often uneven, so that a locomotive with more rigid trucks would cause very rapid wear on the tire flanges and on the rails. Even more expensive would be the time lost because of derailments of an engine

This sturdy Whitcomb gasoline locomotive is an efficient aid in spotting cars on road jobs. No vexatious delays awaiting the road locomotive.

with rigid trucks on the sharp turns which are so often found around strip-pit mines, quarries, logging spurs, etc., etc." The steam dinkey certainly qualifies as to flexibility of trucks.

This builder cautions prospective buyers that "it is well to make sure of getting ample power. Figure out what will be the heaviest train load you will have to haul and make your locomotive start in by pulling this load up your steepest grade."

Accessibility of parts is another factor argued for the steam dinkey. "An engine's power should be located where inspections and adjustments can be easily made," says this manufacturer, and concludes, "A locomotive is seldom bought for industrial service with the idea of taking it into a shop for overhauling at regular periods, like a railroad locomotive."

Which looks to us to be about the gist of the whole shootin' match as regards this subject of industrial haulage results.

We showed a well known salesman of steam dinkeys—a man who has sold gas locomotives as well—Mr. Coleman's remarks about the steam engine and its boiler. He boiled. He said, among other things: "A steam dinkey will outwear any other type of locomotive three to one. Certainly its flues may go up in time and its brakes need fixing, but neither event may happen for several years. Several years is usual, not extraordinary, with this type. With a gas locomotive you have to have new piston rings long before the years have started to roll. You have to have new bearings soon, almost invariably; your cylinders must be rebored before very long. This means more money than new tubes for a steam dinkey. A good many contractors don't use brakes. They reverse their steam dinkeys. Show me a gasoline engine that can start and go right back. You can drive a steam dinkey as fast as it will go, continually, and not hurt it. Try running a gas engine at top speed and strain right along. A gas engine is a series of internal explosions. A constant hammering on pistons and gears. Steam leans to it gradually. Steam can successfully compete with gas and electric locomotives in all industrial haulage—save in tunnels and mines.

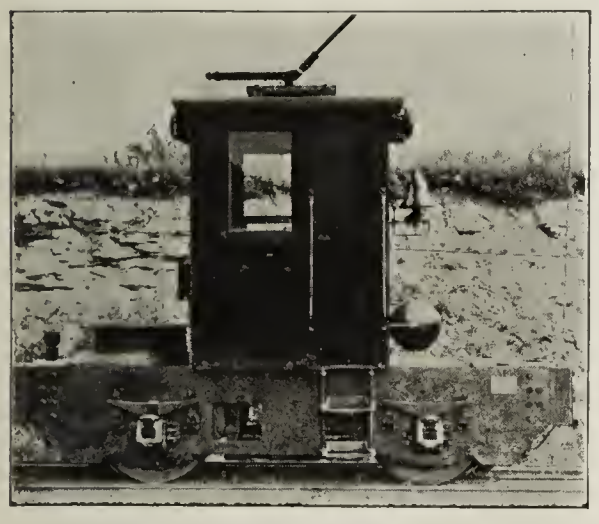
A strong Baldwin internal combustion locomotive in quarry work.

"Water troubles? Mostly propaganda. In actual practice most any kind of water goes. Frequently the water right in alkali pits and limestone quarries does duty. Slag forms around the flues and on the bottoms of the boilers, all right, but it can be cleaned out with less effort than it takes to clean out carbon. Once a year is enough, as a rule. There are ten to fifteen washout plugs wherein slag can form. Bring on the ditchwater, river water, any kind. I say the steam dinkey will last longer than any other kind; and the repairs are practically nil up to the third year at least. The first year 'there ain't no such animal.' All steam manufacturers guarantee their locomotives the first year. They are seldom called upon to replace any part or all of one. Repair parts are cheap—cheaper than for either gas or electric machines. Furthermore, the owner doesn't have to go to the manufacturer for parts—he can make 'em himself. Many users don't even buy brake shoes—they have them cast. Another thing is the accessibility of parts. All operating parts are on the outside. There are fewer parts. And the more parts to watch, the more your worry.

"Any hunky can run a steam dinkey. He can learn in fifteen minutes. There's nothing to do but reverse gears and pull the throttle. A licensed engineer is not required at all, so far as I know. There is no real care-taking about this type of engine. It can stand any use or abuse. No shops are needed. The steam dinkey can stand outdoors, in the pits, anywhere. And she never fails to run—ever notice that? There are no breakages. There's nothing to break. There are no extras with steam. No starter needed. Everything, including the headlight and steel cabs, comes along. Depreciation is not so heavy with this type. Users can get 75 per cent after a year easily. When this type is junk, it has to be worn out.

"If you're running only three hours a day gas is cheaper; but if you're going to run all day and every day steam is cheaper in the long run. Coal? A quarter of a ton will last all day for a good-sized locomotive—for as high as a 20-ton engine. You use more lubricating

oil with gas engines. Everything about one eats oil. With steam engines there are just the cylinders, which are slow duty and push at both ends. It's hard to tell what's wrong when a gas engine stops. The average man doesn't know what the trouble is—like as not the expert doesn't either. It may be the whole ignition system, the feeding, the timing, what-not. How are you going to find it? Steam cylinders go for years before they become the least bit out of true, then it's easy to repair them. A kid can tell by the uneven exhaust when a steam engine is losing pep. We can handle real loads up to 5 per cent grades with steam; and anything this type of engine can climb over doesn't hurt the mechanism any. You can't take a gas or electric locomotive over a hill without extra wear and tear and fuel. Something will break with a gas engine before its capacity is reached. With a steam dinkey there's no harm done when the drivers slip. You've got to have weight to get pulling power. For the first few months on the average industrial job the

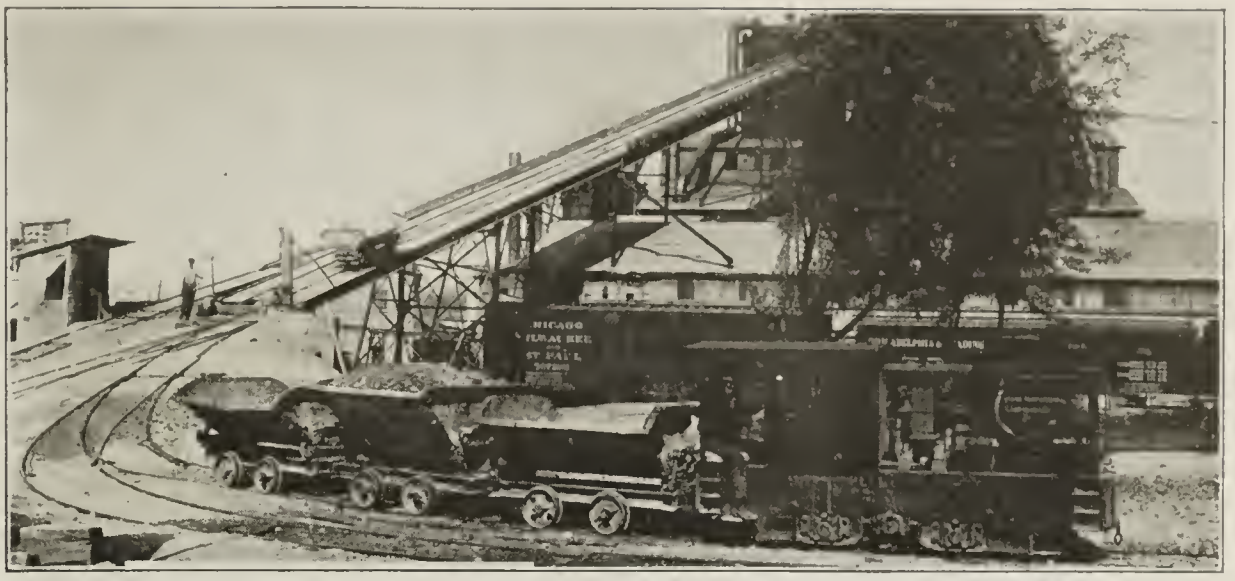


A compact General Electric trolley locomotive.

gas locomotive may be the thing, but I won't concede it for a year. When a gas engine goes it goes altogether."

Enter the "Observer"

We interviewed a man whom we will call The Observer because he has been nearly everywhere, seen a good many things, and has sold and operated all three types of engines. He summarized the place of the steam dinkey as follows: "Principally used where coal and water are available at a low price. The life of a steam dinkey is probably five times the life of either the gas or electric kind. There is less wear and tear on the engine all the way through. Repairs are usually less the first three years. But to run a



A Plymouth gasoline locomotive at the plant of the Palmer Lime & Cement Company, York, Pa. These engines are made by the Fate-Root-Heath Company of Plymouth, Ohio.

steam dinkey you must know something about engines. In some towns and states the operator must be a licensed engineer. Water and boiler troubles do enter in. The ton mile cost—the expense of hauling a ton a mile—all things being equal, will be less with gas than with steam on account of the availability and cheapness of gasoline, the fact that anybody can run an auto-locomotive, and the popularity of the unit in making repairs.

"On a road job in Ohio last year a steam locomotive—8-ton size—proved more destructive to track than gasoline locomotives. Such a dinkey was found a destructive load under such track conditions as the shoulder of the clay road grade made possible. The track used was 24-inch gauge with 28-pound rails, spiked to wood ties, which is much heavier construction than usual. The result was a compromise—track maintenance was cut down by hauling half way out with the steam dinkeys and then picking up the trains with 6-ton gasoline locomotives."

Conditions being the determining factor again.

Some of the uses for the industrial steam locomotive suggested by these two men are: Around—cement mills, stripping operations (coal and quarry), quarry hauling proper, steel and iron plants, switching of all sorts, tie-treating plants, lumber and logging camps, short-line railroads, railroad contractors, road builders, sand and gravel pits, smelters, car shops, foundries, brick and tile plants, etc., etc.

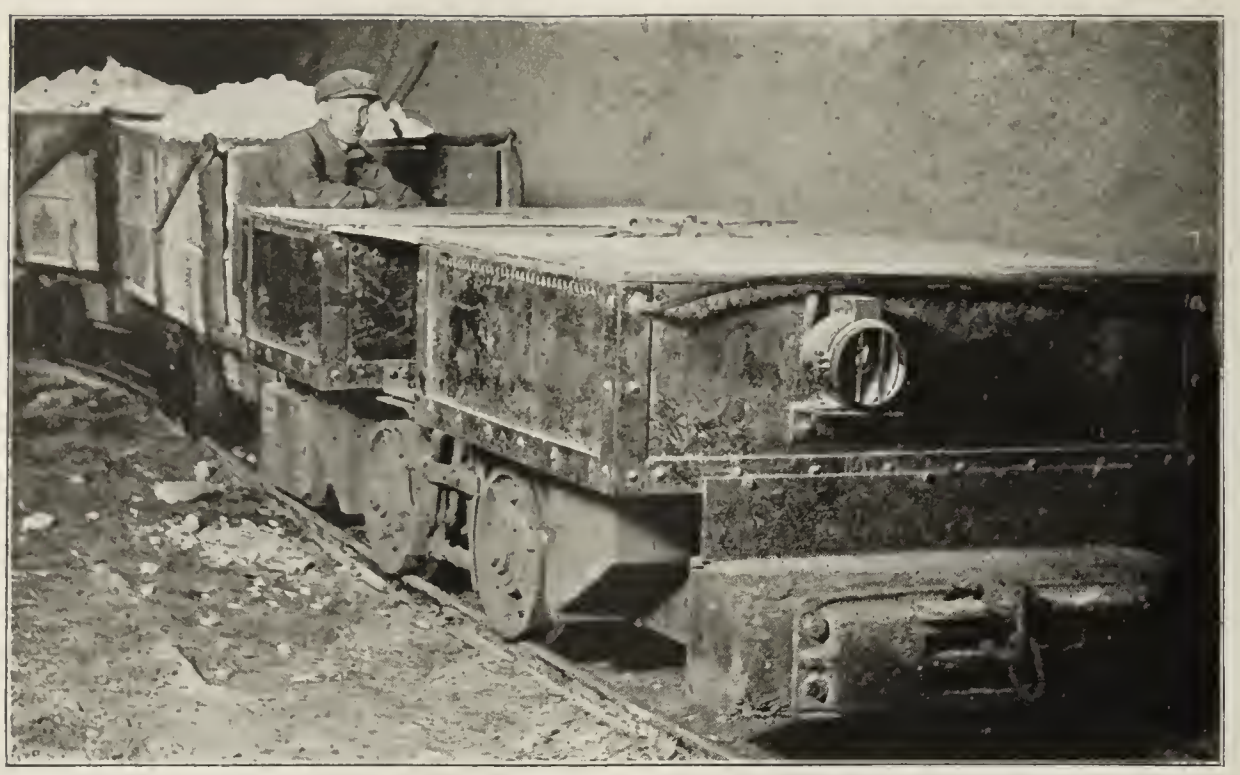
The Advantages of Gas

As for the place of the gas locomotive, our friend The Observer said: "This type can run anywhere in any temperature in any climate that either steam or electric engines can run, but without the usual difficulties of overhead trolley wiring and battery troubles as against the electric type and water and coal troubles

A rugged type of electric locomotive built by the Goodman Manufacturing Company of Chicago and working in a Pennsylvania plant.

as against the steam. It is easy to repair. Anybody can run one. Gasoline is everywhere nowadays and uniformly reasonable in price. Going up? Doubtless, but coal is not as cheap as it was, and not always so available when and where needed. Besides the possibility of getting power from cheap alcohol is

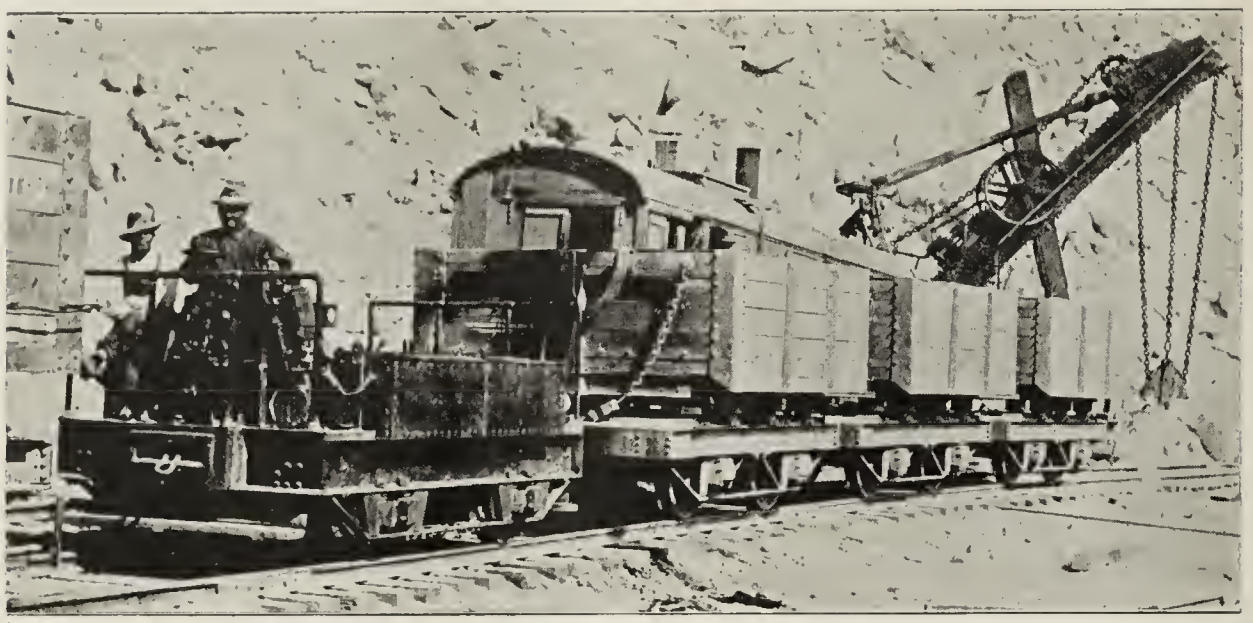
A fifteen ton Jeffrey trolley locomotive employed at the plant of the Empire Limestone Company at Pekin, N. Y. Note the six car train is heavily loaded with stone.



An Ironton storage battery locomotive in limestone work at the Ironton Portland Cement Company's plant, Ironton, Ohio.

just around the corner." Manufacturers and salesmen, with him, claim for this type—reliability, great flexibility, ease of operation, popularity of repairs, low cost of installation and upkeep.

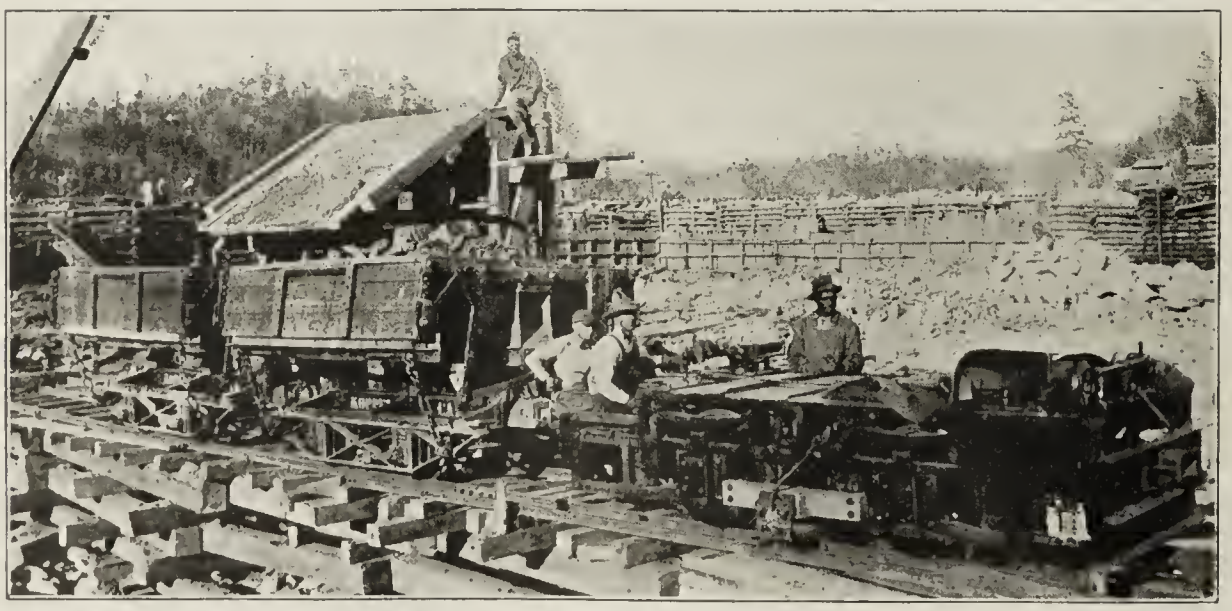
ture use them, brick and tile makers, lime and stone quarries, cement mills, sand and gravel pits, gypsum and gypsite producers, mines of various sorts, smelters, oil fields, fertilizer plants, tunnels,



A storage battery locomotive built by the General Electric Company and in use at the California Portland Cement Company quarry, Death Valley.

The uses to which the gas unit may be put are ample, according to this man and various makers. For instance: road contractors and contractors of every na-

switching yards, sanitary commissions, fruit organizations, paper mills, sugar plantations. car shops, powder mills, foundries, tanneries, stripping operations,



An eight ton electric locomotive built by the Westinghouse Electric & Manufacturing Company, and equipped with a motor driven cable reel. This is in use in the construction of a dam for a large power project in Alabama. Note the power is supplied from a third rail.

chemical works, plaster plants, potteries, etc., etc. Manufacturers claim a real economic service in releasing heavier and more expensive machines for the longer and harder hauls.

The Age of Electricity

But this is the age of electricity and so the electric locomotive must occupy the position of last but not least in this discussion. (Distinction between the storage battery type and the combination—trolley and battery—type cannot be made here on account of space limitations, so any discrepancy in that reward will be overlooked.) As one manufacturer says: "Electric locomotives are now available in various sizes and weights and afford the industrial plant the means of solving, in admirably economical manner, the problem of transportation of materials and products.

"Electric locomotives for industrial service have numerous advantages. As compared with steam locomotives, they (1) avoid the fire risks which prevent indoor operation; (2) give uniform tractive effort; (2) have higher momentary overload capacity for quick starting; (4) work better on grades; (5) consume no power and require no attention when not actually at work; (6) are easier of operation and control; (7) are operated by only one man; (8) may be run by lower-wage men; (9) are simple and compact in construction, insuring long life and low upkeep expense; (10) are rugged and strongly built, and will endure without injury the abuse due to a greater degree of carelessness in handling, etc."

Following are some of the industries which can make particularly good use of this type of locomotive, according to the above manufacturer and others engaged in making and selling the electric dinkey: Brick, tile, pottery and other clay working plants, cement mills, lime plants, stone quarries, smelters, furnaces, iron and steel mills and coke plants, tunnel driving and spoil disposal, dam, canal and aqueduct construction, large engineering projects of all sorts, creosoting plants, dock and terminal warehouses, foundries, glass factories, light and power plants, glue plants, gypsum mines, coal mines and lumber mills, packing houses, phosphate plants, sand and gravel pits, sugar refineries, etc.

Our friend The Observer summarizes this type as "best adapted to short hauls around industrial plants, mine and tunnel operations. Anybody can run one; but accommodations are the most important consideration. This type of locomotive can get hold of a car or a train and haul it a mile cheaper than anything else, once its source of power is taken care of; but the cost of installation is the greatest of all. If it's a trolley locomotive you have got to put in a trolley system. If it's the storage battery kind, you have to have accommodations and take care of them. All of which is admittedly expensive."

Opposed to his opinion, many students of industrial transportation consider the electric locomotive—as the newest in the field—as a comer; and one well known writer claims, for example, that "from the standpoint of economy, simplicity and general fool-proofness the storage battery locomotive (particularly) bids fair to be the greatest success of them all. The marked success of this type in the coal mines of this country during the past few years has led to its

(Continued on page 36)

Phoenix Plant Completed at Birmingham

Plant No. 2, of the Phoenix Portland Cement Company, Gets Under Way After Establishing a Building Record

(Illustrations Courtesy Manufacturers' Record)

A general view of the new fifteen million barrel cement plant of the Phoenix Portland Cement Company at North Birmingham.

Many new ideas in the design of the modern cement plant were embodied in the construction of plant No. 2 of the Phoenix Portland Cement Company, capable of producing 1,500,000 barrels yearly, recently completed on the company's 105 acre tract about one-half mile from the city limits of Birmingham, Ala., and located on the main line of the Louisville & Nashville Railroad at North Birmingham. In designing the plant, the engineers chose buildings of steel and reinforced concrete, using no wood or corrugated iron.

By the use of many refinements in design, the plant is able to produce cement by the "dry mix" process equally as satisfactorily and at less expense than it could be produced by the "wet mix" process of manufacture, it is claimed. With the exception of a small service engine, all equipment in the plant is electrically driven, motors totalling 5,000 horse power being installed. Great flexibility of operation is further obtained by the separate operation of each unit, making one part of the plant independent of the other units and lessening considerably the possibility of a general shutdown because of mechanical difficulties.

The plant is well situated with regard to raw materials, as it has available a supply of limestone rock, uniform in composition and with very little overburden. The plant is now working a forty foot quarry face of rock which will be mixed with nearby shale. The rock in the seventy foot second face resembles closely that found in the rich Pennsylvania districts. Six drills are being used in starting the operation of the quarry, but after it has been opened, two well drills will be used almost exclusively. Two 62 ton electrically operated crawler type full revolving shovels load the rock, after it has been blasted, into 8 ton 32 inch gage all-steel dump cars. A storage battery locomotive is used in the surface operations of shifting empty and loaded cars in rock service, while a 15 ton locomotive is used for similar general work.

The rock, after being loaded into dump cars, is pulled up to the ground lever storage tracks, from which it goes up a 20 degree steel and concrete incline to the crusher. Between the quarry and the crusher building, the cars are handled by a cable drum hoist run by a 100 horse power motor, the controls of which are situated so that the hoist operator can see the car from the time it leaves the pit. A cable drum lifts one side of the dump car, allowing the rock to fall into a 36 inch crusher. After the rock leaves the bottom of this crusher, it is carried by a conveyor to the hammer mill, and from there it shoots directly to the covered storage pit, traversed by an over-head electric crane. The crane way, 400 feet long and having an 80 foot span, supports two 8 ton cranes which are able to take care of all of the storage pits. The cranes themselves carry clam shell cable-operated buckets, each having a capacity of 3 yards. The cranes pick up the rock and either distribute it to the storage bins or carry it directly to the weigh or mix bins opposite.

Three of the 150 foot kilns.

The plant owns at Lewisburg, Ala., an immense quarry of shale, some of which is high silica and some of which is low silica. These two grades can thus be mixed to obtain cement which will come up to specifications. The pit is equipped with a 13 inch gyratory crusher and rolls, from which belt conveyors carry the material to an elevated reinforced concrete storage bin of 200 tons

Four tube mills direct connected to 400 H. P. Synchronous motors.

capacity. From this it may be dropped easily and quickly into cars on the standard gage track below, taken to the plant over a private railroad, run above a hopper pit, bottom dumped, and then, through the crane runway, taken directly to the mix bins or placed in one of the three 800 ton capacity concrete storage bins.

The limestone is weighed on a 36 inch Poindometer at the mix or weighing bins, while the shale is weighed on a 20 inch Poindometer. These two weighing machines discharge onto a 24 inch pan conveyor, which takes the materials to two 7 foot by 70 foot dryers, fired with pulverized coal forced by compressed air from the coal crushing plant.

Over $100,000 has been spent to make the chimney discharges as near dustless as possible. To this end each dryer is equipped at its feed end with dust chambers, which reclaim the dust and feed it again into the dryers.

The single mill building, which grinds both raw and finished materials, is one of the distinctive features of the plant. Four separately controlled units take care of the raw grinding and four separately controlled units work with the finished materials. The great flexibility thus obtained because of the fact that a breakdown in any one unit involves only that unit, is made still more distinct by the fact that any of the mills may be used for either raw or finished grinding.

The four gear-driven preliminary mills are each connected directly by a flexible coupling to a 300 horse power motor, while the four 7 foot by 26 foot tube finishing mills, each charged with fifty-five tons of inch and one-quarter cylpebs, are each driven by a 500 horsepower 180 r. p. m. synchronous motor through a 60 inch magnetic clutch. The eight mills can produce a total of 12,000 barrels each day, which may be divided, because of the double system of conveying machinery, into whatever proportion of raw and finished materials is desired.

Five silos, each having a capacity of 2,000 barrels and each being 17 feet in diameter and 65 feet high, situated adjacent to the mill building and parallel to the grinding units, receive the raw material from the tube mills by means of a conveyor. These bins are called "blending bins." Rotary feeders lead from the bottom of each of the silos, so that by use of the variable speed control, any amount of material may be withdrawn from any of the bins, insuring an easy and accurate chemical mixture for the cement. Another conveyor, operating beneath the rotary feeders of the five silos, carries the material to the raw mix bins at the head of each of the three kilns. Each kiln is 10 feet by 150 feet, is driven by its own motor, and has its own fan directly connected to an individual motor. Screw conveyors take the material into the kilns, where it burns and clinkers and is discharged by the ⅜ inch to one foot slope. The clinkers are deposited by a drag conveyor within the craneway pits, from where they are either taken to the 15 foot by 15 foot concrete hopper, connected to the mill building by a 24 inch pan conveyor, or stored for use later on. The kilns all use pulverized coal for fuel.

Six reinforced concrete silos, each 32 feet in diameter and 85 feet high, are capable of storing 110,000 barrels of cement. Four packing machines in the packing room, immediately adjoining the silos, discharge the packed cement onto two conveyors, which take the full bags of cement directly to railroad tracks. Sixty loaded cars and sixty empties may be accomodated at one time on the tracks owned by the cement company. An additional loading station, 25 feet by 60 feet, is designed to take care of local orders to be carried away by truck.

A bag house, 48 feet by 198 feet, adjoins the packing room. Here, of course, the bags are repaired, cleaned, and stored.

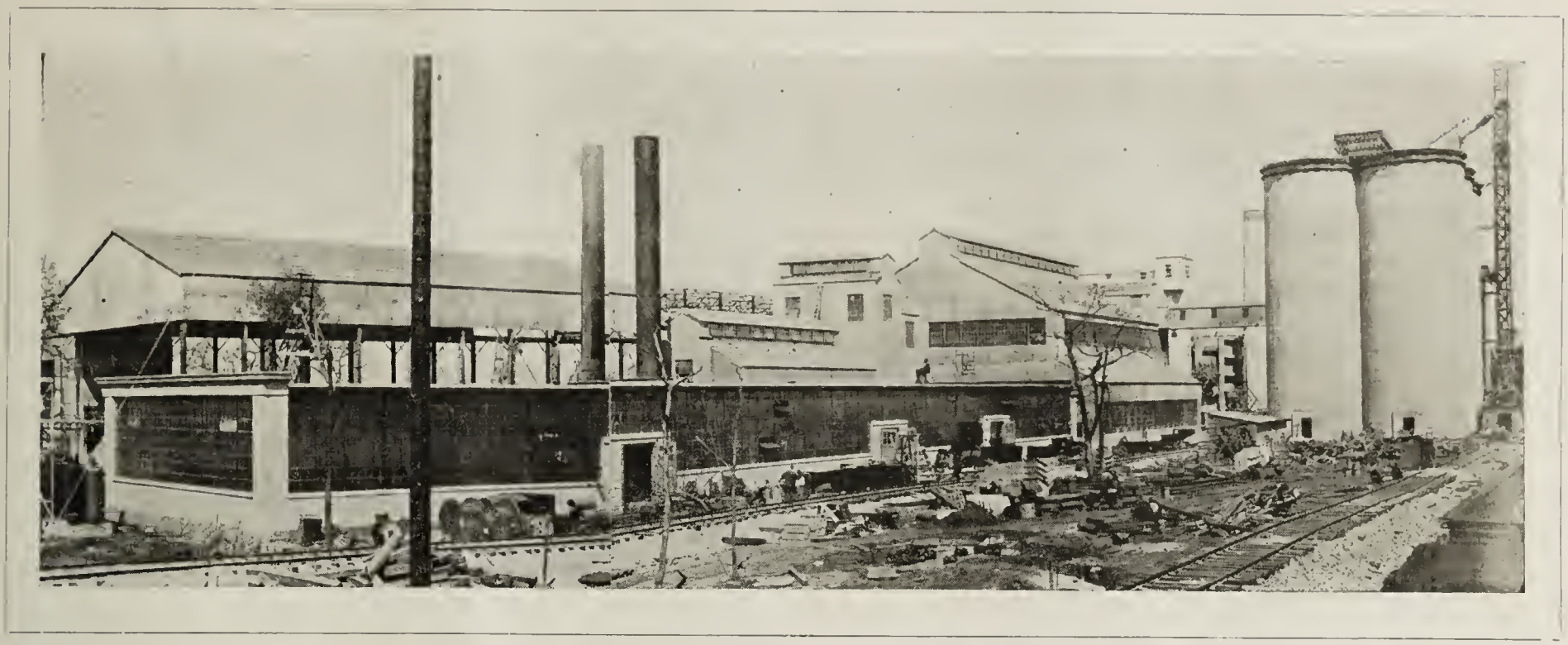
The coal pulverizing equipment has all been placed in a separate building. The coal is dried in an indirect coal-fired dryer, and is pulverized by three 42 inch gear-driven mills. It is then pumped by compressed air to the various parts of the plant. At the feed end of each kiln there is a dust chamber, which settles and reclaims dust. Each chamber is 70 feet long, 30 feet wide, and 40 feet high, is built of reinforced concrete lined with fire brick, and contains four compartments, or three baffles. The chambers are hoppered at the bottom and screw conveyors underneath carry the reclaimed dust back to the raw silos. The stacks, of which there are three, are built of reinforced concrete, each 8 feet in diameter and 103 feet high.

A building, 50 feet by 260 feet, houses the machine shop, the blacksmith shop, the storeroom, and the switchboard room. Here all kinds of repair work for the entire plant may be done. Power comes into the substation building at 6,600 volts over two 3 wire circuits, and is stepped down to 2,300 volts for use on the larger machines and to 440 volts for the smaller ones. Direct current for the cranes, magnetic clutches, and kiln motors, is obtained through the use of two rotary converters, both being 250 volt 300 kilowatt installations. Only one of these will have to be used at a time, the other being always held in reserve for emergencies. The power used is purchased from an adjoining steel plant, which makes it by using waste gases of by-product coke ovens.

The crusher is the only machine in the plant not working through silent chain drives. It uses a belt drive instead. Compressed air is obtained from a 620 cubic foot compressor, while another compressor with a capacity of 320 cubic feet is held in reserve for emergency use. Clinkers are to be cooled by water pumped from the quarry, while other water is furnished by the City of Birmingham and by pumps installed at a nearby stream. The coal, which is mined about a mile from the plant, will be handled by a 15 ton locomotive crane, and will be brought to the plant over a private railroad in equipment owned by the cement company. It will have a heating value of 13,000 B. T. U.'s per pound.

The following concerns furnished materials and equipment for the new plant: The Sanderson-Cyclone Drill Co., Orrville, O., two Cyclone well drills; Ingersoll-Rand Co., New York, four No. X-70 drills; The Marion Steam Shovel Company, Marion, O., two Marion No. 37 electrically operated crawler type full revolving shovels; Easton Car & Construction Co., Easton, Pa., "Phoenix" type all steel dump cars; General Electric Co., Schenectady, N. Y., storage battery locomotive, motors, and rotary converters; Davenport Locomotive Works, Daven-

Four gear driven mills connected with 300 H. P. motors.



Another view of the plant with the machine shop in the foreground. Behind this are the stone storage, dryer and mill buildings. At the right are shown the finished silos.

port, Ia., one 15 ton locomotive; S. Flory Mfg. Co., Bangor, Pa., cable drum hoist; Worthington Pump & Machinery Corporation, New York City, 36 inch Superior crusher; Link-Belt Company, Chicago, Ill., conveyors; Pennsylvania Crusher Co., Philadelphia, Pa., Pennsylvania hammer mill; Champion Engineering Co., Columbus, O., two 8 ton Champion cranes; Traylor Engineering & Manufacturing Co., Allentown, Pa., one 13 inch gyratory crusher and rolls and four 7 foot by 26 foot tube mills; Schaffer Engineering & Equipment Co., Pittsburgh, Pa., one 36 inch and one 20 inch Poindometer; Vulcan Iron Works, Wilkesbarre, Pa., Vulcan dryers and kilns; Bradley Pulverizer Co., Allentown, Pa., four gear driven Bradley Hercules mills; Cutler-Hammer Co., Cleveland, O., 60 inch magnetic cluches; McDonald Engineering Co., Chicago, Ill., silos; Bates Valve Bag Co., Bates packing machines; Fuller-Lehigh Co., Fullerton, Pa., coal pulverizing equipment; Webber Chimney Co., Chicago, Ill., concrete stacks; Orton & Steinbrenner Co., Chicago, Ill., one 15 ton locomotive crane; Southern Gypsum Co., Holston, Va., gypsum; Rust Engineering Co., Birmingham, Ala., kiln dust chambers; Cement Gun Construction Co., Chicago, Ill., Gunite cement; American Cement Tile Mfg. Co., Pittsburgh, Pa., roofing; Virginia Bridge & Iron Co., Roanoke, Va., and Birmingham, Ala., 1,000 tons of steel work; Austin Co., Cleveland, O., the building used as the machine shop, etc.; David Lupton's Sons Co., Philadelphia, Pa., doors and windows; Walsh & Weidner Boiler Co., Chattanooga, Tenn., storage bins; Merrick Scale Mfg. Co., Passaic, N. J., Weightometers.

Standardization of Construction Equipment

Committees of Manufacturers of Constructive Machinery and of Contractors and Mechanical Engineers Work to Cut Expenses

WASHINGTON, July 28—As part of a movement for the standardization of construction equipment a committee composed of represenatives of the Associated General Contractors, the American Society of Mechanical Engineers and the Construction Equipment Manufacturers has approved a plan of standardization of concrete mixers and wheel barrows.

Standardization, the committee predicts, will cut expenses by reducing the number of sizes, repair parts and costly delays in construction work. The program is designed also to establish competition among equipment manufacturers on the basis of quality.

C. E. Bement of the Novo Engine Company, Lansing, Mich., is chairman of the joint committee on construction equipment. The committee took action at a meeting held in Chicago and has reported its recommendations to the Associated General Contractors for final approval. The joint committee approved the standardization plan as presented by concrete mixer manufacturers representing about seventy-five per cent of the non-tilting type of the country, in accordance with the following:

"Specifications and recommendations in the report were approved.

"The final development of the standards is to be officially tied in with the American Standards committee, and sponsorship for the development is to be placed with the Associated General Contractors of American and the American Society of Mechanical Engineers.

Standards are to be designated as A. G. C. standards until such time as the American Engineering Standards committee, authorizes them to be designated as American standards.

"The proposed standards are to become effective upon approval of the executive board of the Associated General Contractors and will as soon as possible thereafter be followed in the manufacture of non-tilting drum mixers."

The report approved by the joint committee includes fourteen provisions for standardization of concrete mixers, these embracing some thirty specific points. A reduction in the number of types manufactured is provided. The report relates only to the horizontal non-tilting drum type of mixer.

The text of the committee report follows:

1. Standard of measurement: (a) The standard of measurement of drum capacity shall be the cubic foot. It is recommended that water be used as the medium of measurement. (b) The standard for water tank measurement shall be the U. S. standard gallon. (c) The rating of boilers, steam engines and gas engines, shall be referred for advice to the American Society of Mechanical Engineers, and the rating of motors to the American Institute of Electrical Engineers.

2. Method of Measuring Drum: (a) The water level capacity of the drum standing still shall be used as the capacity of the drum. (b) The size of the mixer shall be designated by a number indicating the nominal rating of the mixer according to the capacity in cubic feet of mixed concrete per batch.

3. Rating of Drum: (a) The water level capacity of the horizontal non-tilting type mixers with openings at both ends shall be between the maximum of 107 per cent and the minimum of 102 per cent of the nominal rating. (b) The water level capacity of the horizontal non-tilting type with openings at both ends but with discharge opening closed during mixing action, shall be 50 per cent of the nominal capacity or rating. (c) The maximum operating grade to be considered in the rating of pavers is 5 per cent.

4. Table of Aggregate Proportions: A standard table of mixed aggregates from authoritative sources shall be adopted and published by the manufacturers. This table will give the quantities of mixed concrete for the various proportions of mix with certain percentages of voids in the aggregate and certain quantities of water. The standardization steering committee shall furnish the table.

5. Standard Sizes of Mixers: (a) There shall be three sizes of paving mixers manufactured, namely; the 7-E, the 12-E

(Continued on page 47)

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Warren Gamaliel Harding

As this is being written, countless thousands of people form mourning columns across the continent, columns of people paying their last tributes to the memory of the dead chieftain, whose special funeral train speeds by.

To those people and to us, Warren Gamaliel Harding was not a personal acquaintance. We knew him not as a human being who remained calm, genial and kind despite his glories. We knew him not as a self-sacrificing friend, nor as a man with a hearty handshake.

He was to us, rather, a splendid representation of an ideal—an ideal of Americanism. We knew him as a relentless, untiring leader, working unceasingly to apply remedies to present-day conditions so as to bring the nation once again back to "normalcy."

We knew him as the foremost exponent of the "America first" policy, as the chief whose administration, through the Washington Disarmament Conference, took what may prove a great step toward more lasting peace, as the man who, despite his multiplicity of national and international problems, found time to cast his influence and his talents toward the solution of labor problems.

We knew Warren Gamaliel Harding as a man who had risen from the ranks of average Americans to the highest elective honor in the world. We knew him always as crystallizing in his being the true standards and ideas of this great nation.

Concrete Popularity

The use of concrete, both precast and poured, as a building material, has jumped ahead by leaps and bounds during the past few years. Processes have been discovered, capital has been interested, and a mammoth industry of which our forefathers never dreamed has sprung up.

With every growth, however, there enters the question as to whether or not the industry is keeping pace with the present demand for its output. Is the manufacturer, in other words, putting all of his attention on production instead of devoting some of it to the improvement of his product? Such accusations have sometimes been made against the makers of concrete building stone. The public has at times, it seems, grown tired of the gray monotony of concrete structures, an indictment which has its basis, of course, not in the lack of durability or desirability of the product, but rather in the paucity of its artistic appearance.

The future of the industry as a field capable of unlimited expansion may depend upon variation of form and color in concrete precast construction. The first part of this program has already received consideration. We now see plain faced blocks and a whole family of more unique styles. Color, however, has not yet been employed to any appreciable extent, probably because of the mechanical and chemical difficulties it causes in the mix and in the finished product.

Research, if it has not already found the way to color concrete at the time it is being mixed, will soon be able, no doubt, to announce such a discovery. When it does, artistic arrangements and combinations of colors and shapes will cause an increased clamor on the part of the buying public for precast concrete construction.

Are You Underpowered?

With competition growing fiercer every day and with the growing confidence in the business principle of quantity production, of relying on sales volume and small profits rather than on big profits on few sales, the problem of production on an efficient basis becomes an acute one. Often the application of the principles of efficiency produces the only profit on an adventure and, conversely, often the failure to apply those methods leads to a direct loss. Of necessity, the day of the cost accountant and the corrective industrial engineer has come to stay.

Transferring raw materials from place to place has long been recognized as the considerable factor in costs, but despite its recognition, little has been done toward the thorough investigation of these costs. Does it cost too much per ton per mile to haul a given material? Is it costing the cement mill too much to transport rock from the quarries to the crushers? Is it costing the contractor too much to carry his material from the point of unloading to the job?

The answer to these questions might involve certain complex considerations, but it is safe to say that one of the most frequent haulage leakages is found right in the locomotive and the load it has to haul. Not that the locomotive itself should be thermally, mechanically, or electrically one hundred per cent efficient, for that admittedly is an impossibility today. The correctible leakage, however, relates to another phase of the problem. Are two hauls being made, when, by using a more powerful engine, more cars could be added for a single haul? If such is the case, labor and operating charges are mounting too high, for the same number of men, operating a more powerful engine, could take care of additional cars, not only cutting down the number of hauls, but also perhaps increasing appreciably the speed of transportation, thus reducing the cost per ton per mile.

To a great many men in the industry the problem is important. An investigation of power requirements and the equipment in use may reveal the fact that changing the size or type of engine will soon pay for the new installation and subsequently make for bigger production profits. The matter will at least bear the thorough consideration and investigation of any plant which has appreciable charges accruing for local hauling.

Shall the State Operate Cement Plants?

IV

It is a fundamental principle of economics that a loss in industry is a loss to society as a whole and is not confined to the business or the corporation sustaining that loss. Stated reversely, this means that the nation or state is prosperous where the majority of its industries are prosperous. Any condition which contributes to the success of industry contributes to the well-being of the entire nation; anything which tends to turn profits into losses tends to undermine the common weal.

This statement finds support and not contradiction in the negative effect of the profiteer upon national prosperity. His tactics depreciate the value of money, weaken the buying power of the individual, and cause real loss to other industry. Hence, since through his unjustified tax upon the community he creates losses, he is a detriment to the nation as a whole.

It is when private industry is confronted with the necessity to serve adequately in order to "get business" and forced through competition or right principles to take an honest wage for the services performed, that national and individual prosperity are born and thrive. If government ownership or control of private industries could contribute to this end they would be welcome and economically justified; it is because, in every instance on record, government has stepped out of its function in order to control a private business, chaos has resulted that such practice should be opposed by every citizen.

To demonstrate our thesis we have so far discussed coal and the railroads: in this article we cross the water and discuss England's experience with government controlled telephone lines. During the war we had our own experience with telegraph communications; England's experience in state operated telephones does not strengthen one's faith in the ability of the government to handle business affairs.

The state took over the telephones in 1912. The year prior under private ownership and operation, the expenses for 560,000 stations were $8,000,000, handling approximately 800,000,000 calls. This means that it cost the private corporation $1.00 to handle 100 calls.

Under government ownership the working expenses were increased to a point where it cost $5.00 to handle 100 calls, or an increase of five hundred per cent. Since this estimated cost covers the war period, allowance should be made for the increased cost of commodities during that period, but nevertheless it is obvious that government ownership was costly. During the war telephone rates in America remained unchanged.

Then notice the following tabulation showing the steadily mounting increases in cost of operation under government ownership. Although the loss sustained varies year by year even becoming profit at times, the cost of operation mounts steadily. Figures are given in pounds sterling.

	Expenditures	Income	Loss
1912-13	5,543,643	5.846.986	*303,343
1913-14	5,949,064	6,189,175	*239,111
1914-15	6,584,487	6,473,460	111,018
1915-16	6,937,312	6,819,135	118,177
1916-17	7,024,611	7,226,340	*201,729
1917-18	7.484,061	7,839,529	*355,408
1918-19	8,333,307	8,297,046	35,261
1919-20	11,000,000	9,050,000	1,950,000
1920-21	13,700,000	9,720,000	3,980,000

*Profit.

A private industry, operating at a growing expenditure and a loss ranging toward the end to $15,000,000, would shortly be in the bankrupcy courts. In the case of a government, to meet such a deficit there is only one recourse: taxation.

Nor would the case be as black against government ownership if with the loss and the mounting expenditures went an improvement in services rendered. Here is how Hall O'Flaherty, special correspondent of the *Chicago Daily News*, writes regarding the service of the government owned telephones of England:

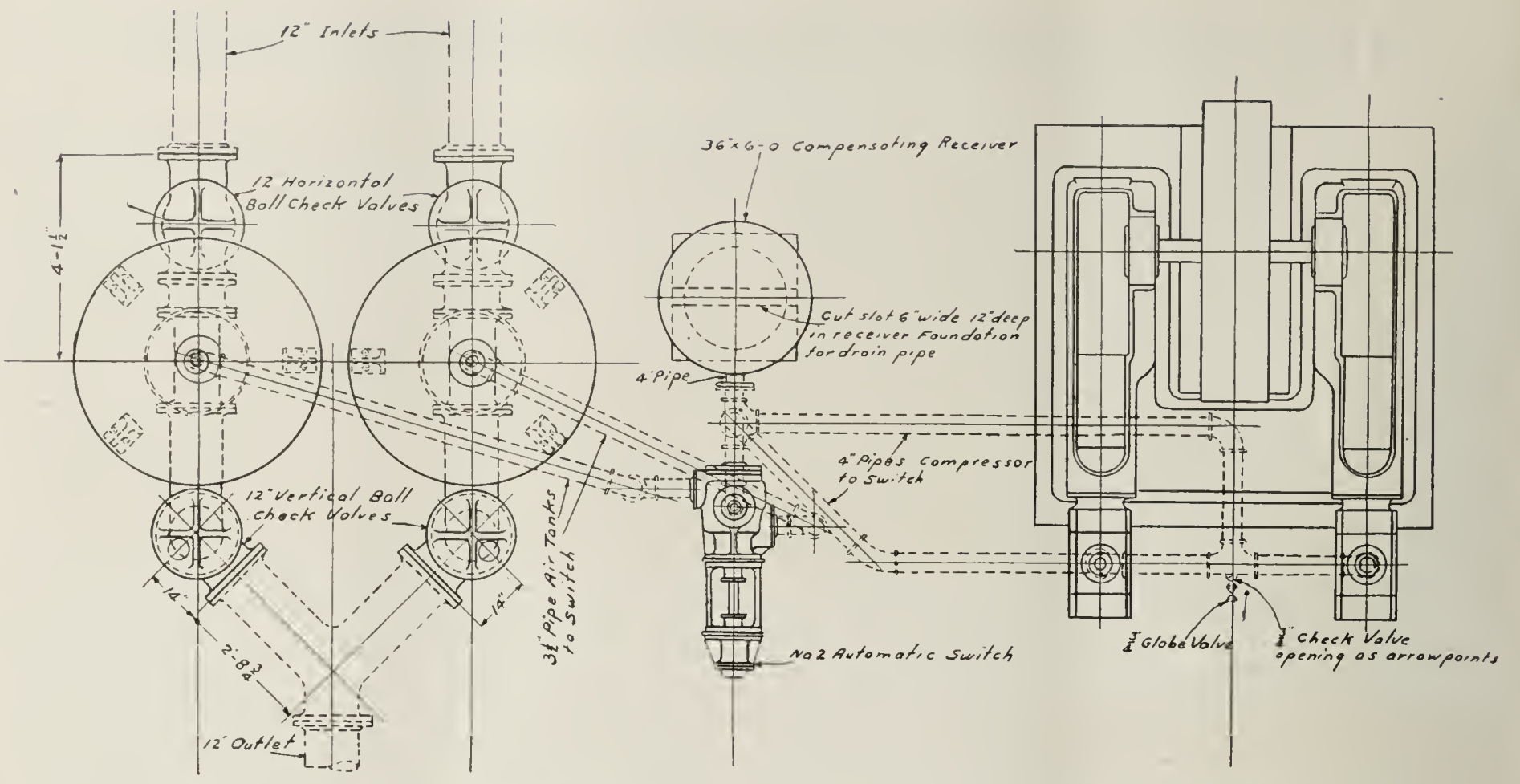
> "In owning and operating telephones, the government is brought into direct contact with the subscriber, and when difficulties arise, is subject to criticism which promote unusual conflicts between the state and individual.
>
> "England's telephone service has been badly hampered by the process of legislative interference. The fact that the government undertakes the telephone service without any desire for profit leads subscribers to feel continually that their interests are not being safeguarded or studied. On the other hand, the subscriber's appeal to a private concern is always expected to produce results, and as a rule it does if the private concern places any value upon its good repute. Appeals to a government department are, as a rule, considered hopeless.
>
> "Experience with the telephone in London is enough to prove that the conditions of government service do not permit the exercise of the initiative and control that are necessary. Under the control of the government the executive staff of the telephone system is not free to select employees as are the executives of a private concern. Nor can government officials promote, reprimand or dismiss as do the officers of a commercial concern."

In short, the experience of England shows the impossibility of getting economic production out of a bureaucracy; it proves, as have the experiments in this country, the importance of the factor of personal interest in developing service such that it will be at the same time satisfactory to the public and profitable to those whose money is invested.

When it is remembered that what keeps a political party in power is one thing and what keeps a manager of a private business in his position is another, it is clear that at no time and under no imaginable conditions can government operation or ownership of private industry be economically successful. The party needs votes, and to get votes it needs popularity; the manager of a private industry, to hold his job, must show a profitable balance sheet. The importance of this balance sheet is shared mutually by the stockholders of the company and the public whom the company serves. Unfortunately administrations are not kept in power on balance sheets.

Hence in a bureaucracy we have conditions which are ideal for economic failure; conditions cannot be conceived which would bring about such failure more certainly. On the other hand, in private management of industry, whether it be telephones, coal, railroads or what not, we have that individual responsibility which alone can be trusted to produce that brand of public service which makes industry profitable.

None would think of intrusting the agriculture of this nation to the government should such control result in killing the crop; when it is shown that government ownership creates losses and profits, kill initiative and responsibility, and carries with it a by-product of increased taxation, who is unwise enough to favor it?



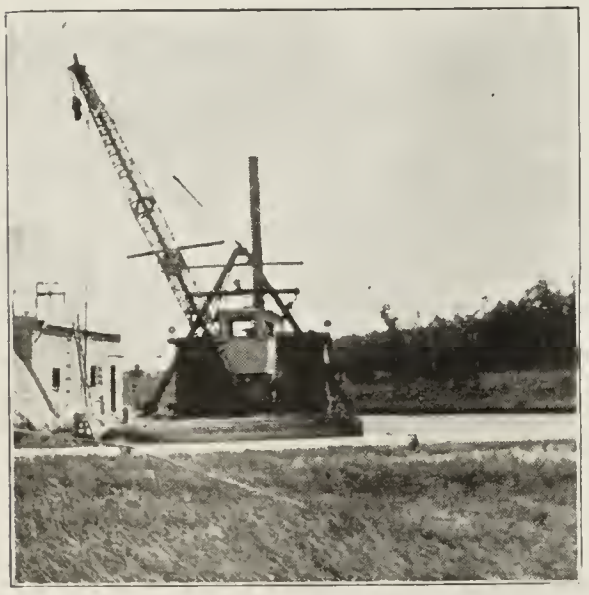
This diagram shows the general layout of the return air pumping system described in the article below.

Transporting Marl With Compressed Air

The Ingenious Method Used By the Peninsular Portland Cement Company in Transporting Marl From the Source of Supply, Two Miles Distant

The plant of the Peninsular Portland Cement Co. is located at Cement City, Mich., thirteen miles southeast of Jackson, in a region which abounds in lakes having extensive marl deposits.

This location was originally selected and laid out with the idea of utilizing this marl to supply the calcium carbonate



Front view of the dredge operating in Silver Lake.

constituent in the raw mix. The company began its operations in 1901 and operated until December, 1919, drawing upon Goose Lake, which is immediately adjacent, for the marl supply.

At this period the easily available supply of suitable marl became exhausted and it became necessary to find another source of supply. In addition the dredging equipment was in a condition making extensive replacements necessary. Thus it came about that an arrangement was made with quarries near Lewisburg, Ohio, whereby screenings and quarry waste were shipped to the plant at a low rate and the mill continued operations, and with the new material effected some saving in fuel while increasing the output of the kilns.

Increasing freight rates, however, soon offset any advantage obtained from the saving in fuel and in the increased production, so in the spring of 1922 the company decided to return to the use of marl. The nearest lake having any considerable supply of marl suitable for use in manufacture of cement was Silver Lake, located two miles from the plant, and the problem of transporting the marl to the plant site became a matter requiring careful consideration. A rolling surface with numerous high elevations exists between the plant and Silver Lake, although the final difference in elevation between lake level and top of wall of marl storage is but twenty-four feet.

Among the systems considered was that of pumping, but the physical properties of the ground, distance and differences of elevation, were such that the pump manufacturers refused to guarantee results. An industrial railway also was considered but the idea was discarded as requiring too elaborate an equipment and a correspondingly large outlay. It was finally decided to install a pipe line and bring the marl over with compressed air.

All the available data was obtained from manufacturers of compressors and return air transporting systems, but the length of line required and volume of material to be handled was far in excess of anything in the line of their experience. Although they were willing to cooperate in every way possible, none of

Showing the pipe line along the Cincinnati Northern railway right of way. In the upper left corner is shown the plant in the distance.

them were willing to accept any responsibility in securing results.

In spite of this attitude on the part of the manufacturers of air transporting

machinery, the plant officials and the consulting engineer made a thorough investigation of the different methods of transporting the material. This, coupled with their previous experience in transporting slurry by means of compressed air failed to impress them with any difficulties that could not be overcome. It was determined to proceed with the transfer of the marl by the air transport system, the only auxiliary safeguard provided being a booster tank which was installed at the first relay station for the purpose of supplying additional air pressure in to the pipe line after the material had left the receiver tanks. The service of this booster has never been required as from the beginning it was possible to pump the material the distance between the first and second relay stations without the slightest difficulty.

Thus in submitting proposals on equipment necessary for this work a clause was inserted absolving the manufacturer from any responsibility for failure to perform.

The plans were started in January, 1922, and the materials were ordered for

A trestle carrying the pipe line through a slough. In the distance may be seen the relay station.

This shows the air pump machinery in the relay station.

a new dredge and scow. In spite of a very severe winter, with the temperature often below zero, the work of building the new hulls on the shore of the lake was carried on almost without interruption by a crew of boat builders from Port Huron and Marine City, Mich., under the foremanship of Colon Stewart of Port Huron.

The dredge consists of a hull 32x76 ft., 6 ft. in depth, built up of 8x12 Y. P. timbers with bulkheads built under engine boiler and boom. The bottom was caulked with cotton and oakum and given a coat of creosote paint while the remainder of the hull was covered with red lead.

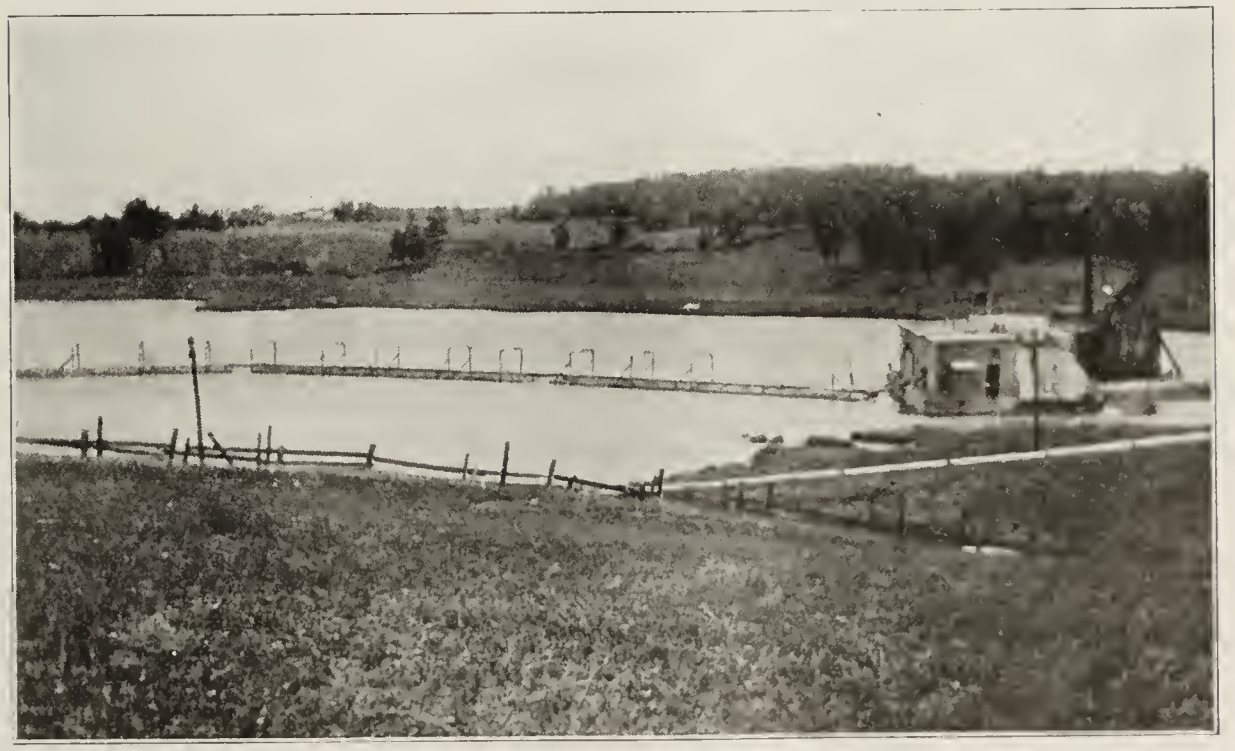
The equipment in the hull consists of a 40-h.p. Lidgerwood boiler and a two-drum engine, a boom which revolves in a half-circle and a Hayward orange-peel bucket which is operated on a double strand chain 1x5 in. links.

The scow consists of a hull 36x65 ft., 5 ft. in depth, of construction similar to that of the dredge. The equipment on the scow, all of which is electrically driven, consists of a separator very similar in looks and action to an exaggerated sausage mill. This separator receives the bucket load of marl from the orange peel, which dumps into the hopper directly overhead. A two-inch stream of water, supplied by a triplex plunger pump, is added and the revolving paddles and screw of the separator force the marl through a screen at the end of the separator, the screen retaining the roots, pebbles or the other foreign matter contained in the marl, which might clog the pumping system. From the separator the marl drops into a small storage vat and is there kept in constant agitation by mechanical means.

The return air system is furnished by the Ingersoll-Rand Company. The unit in the scow consists of an air compressor 11x14 in., driven by 75-h.p. motor, connected to a 36 in. by 5 ft. compensating. receiver.

Two circular steel tanks, 5 ft. diameter by 5 ft. high, located next the storage vat with inlet of tank at level of outlet of vat, are connected with the receiver and compressor through an automatic switch (see diagram), which operates in such a manner that air is drawn from one steel tank, forming a vacuum and causing the slurry to rush into this tank, filling it while the other tank is placed under pressure, causing its contents to be discharged. The switch can be set at any operating pressure desired, and when this pressure is reached the switch automatically trips, causing the operation to reverse so that the tanks are alternately filled and emptied. A standpipe carrying a float valve of height, varying according to conditions, but ordinarily about 20 ft. high, prevents the slurry from going over into the compressor when the tank becomes filled.

The distance of approximately 10,000 feet from the lake to the mill being a greater distance than had ever been tried out before, it was decided to install two relay stations and divide the duty required of any one unit. Accordingly the first



A view of the dredge, scow and the pontoon line from Silver Lake, Mich.

relay was established at a convenient point about 1,700 feet from the lake, in order to give the pumping machinery on the scow the lightest duty at the start and a chance to add additional length of line as the marl became exhausted.

Each relay system consists of a receiving vat of concrete, 18x20x7 ft. deep, a compressor, and pumping system similar to that on the dredge; the distance between first and second relays is 4,400 feet, and from the second relay to plant is under 4,000 feet.

No difficulty is experienced in transporting the marl slurry the greatest distance of 4,400 feet, a difference in elevation of 30 feet, with an air pressure varying from 75 to 90 pounds. A 12 in. diameter pipe is used in the line. This pipe is spiral riveted and furnished by the Abendroth-Root Company of New York. The problems of expansion in the line and the difficulties in making a tight joint encountered in laying the pipe over unequal surfaces was overcome by the use of Root flexible joints, furnished by the same company. This joint slips over the smooth end of a pipe and permits a variation of seven and a half degrees in a single joint, which is of great benefit in negotiating curves and hills. A rubber gasket at each end effectually seals the joint and after a year's operation, no trouble from leakage has been experienced.

A telephone system is installed between the mill relays and the dredge. The dredge requires two operators per shift, the scow one and each relay one. After the preliminary difficulties due to starting up a new installation, it was found that it was necessary to operate the dredge and pumping system for only two shifts of eight hours each and that marl slurry containing about 50 per cent moisture could be pumped over effectively.

Two marl storage vats 80x50x14 ft. were built at the plant with the idea that by pumping one vat full and allowing it to settle, considerable water could be drawn off from the top and drains were provided in the walls of the storage for this purpose.

Raymond E. Kirk of the Engineering Experiment Station of the University of Minnesota, in the summer of 1922, made a comprehensive investigation of cement plants and in a recent bulletin on "The Manufacture of Portland Cement from Marl," says of the Peninsular plant: "The marl used at this plant is of high quality, nearly all of it having well over 90 per cent calcium carbonate, dry basis. The plant is well equipped and carefully managed."

The adaptation of the plant to the use of either marl or limestone gives it a flexibility to be found in no other installation.

John L. Senior is president of the Peninsular Portland Cement Company; A. C. Deer, general manager; F. E. Dodge, consulting engineer, and J. E. Curtis, superintendent. J. S. Kilner, Detroit manager of the Ingersoll-Rand Company, gave valuable assistance in preparation of data on pumping system.

A Handy Chart for the Concrete Man

Very often the concrete engineer wants to compute the number of lengths of reinforcing rods necessary to extend over a given length, the number of lengths to reach a given height, and he has to perform a problem of division. Long hand division is usually a tedious task for every one of us.

Here is a chart that will instantly give the number of pieces by simply laying a straight-edge across the chart. Or, merely stretch a thread across it. The number of rods, or the number of lengths of board required, etc., is instantly given in Column C.

For example, if a concrete beam 500 feet long is to be built and the distance between joints is 9 feet, how many lengths of rod will be needed for each line of reinforcement?

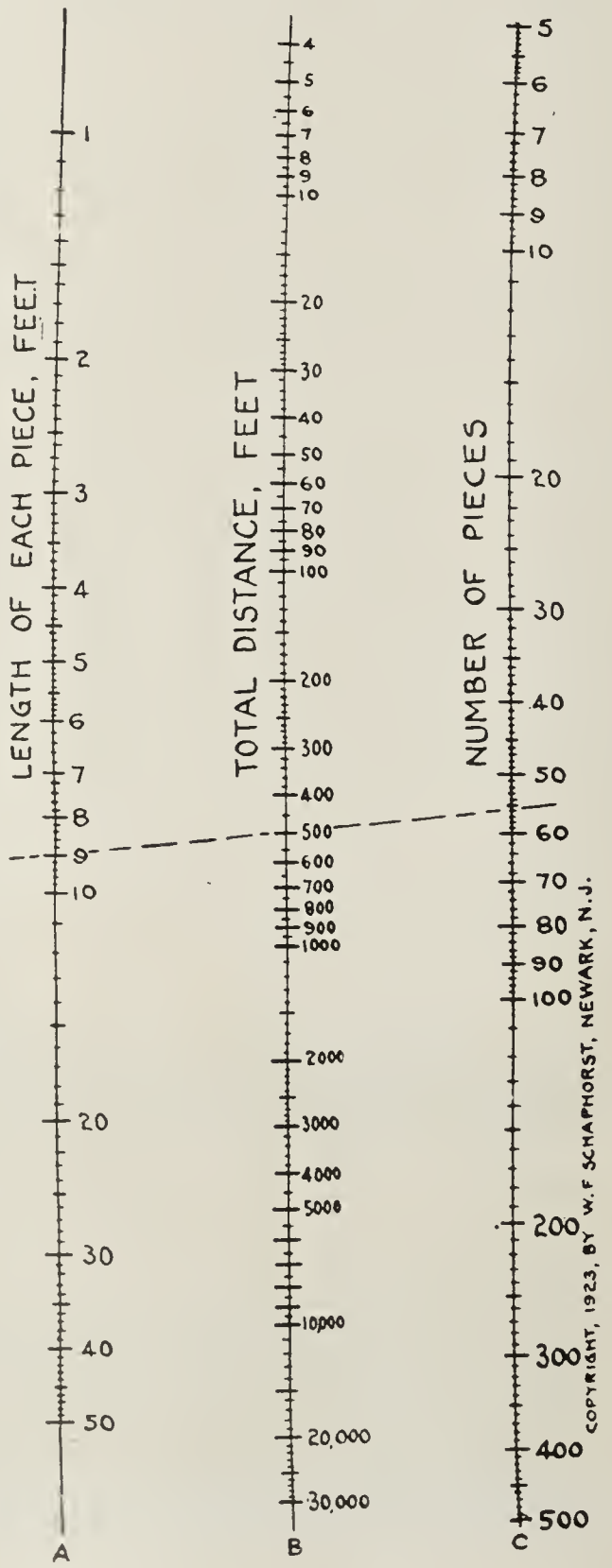
The dotted line running across this chart shows how easily it is done. Simply run the line through 9, Column A, and 500, Column B, and the intersection with Column C shows the answer to be slightly over 55. In other words, 56 rods would be required to make a total distance of 500 feet.

It will be noted that the range of the chart is very great. It will take care of a total length varying from 4 to 30,000 feet. The length of each rod may vary from 1 foot to 50 feet, and it will take care of any number of rods or pieces from 5 to 500.

As a matter of fact, the chart has no limitations whatever. By simply adding two ciphers to any figure in Column B, two ciphers would have to be added to the figures in Column C. Thus, if the total length were 50,000 feet instead of 500, the same doted line drawn across this chart would give the answer as "about 5,600 pieces" instead of 56. Or, if the total distance were 500,000 feet, which means that three ciphers are added to Column B, the answer in Column B would be "about 56,000 pieces."

To be sure, the chart is not "absolutely accurate," but it gives surprisingly close results and is excellent for use in estimating or for checking up one's longhand figures.

After giving it a trial, the user will be amazed as to its simplicity, quickness and accuracy.—W. F. SCHAPHORST.



Industrial Locomotives

(Continued from page 28)

introduction in the industrial fields, and today we find it is being adapted to all classes of industrial haulage." In his opinion, "the electric locomotive has been gaining in favor; and, with the increasing tendency to electrify quarries and stone mines, it will gradually supersede all other methods of haulage." He does not recommend the trolley or third rail locomotive for quarries, however, as the track is invariably temporary and steam shovels are uncomfortable company.

As for repair costs, he contends they are extremely low in the case of the storage battery locomotive—lower than with the combination type. In this he is supported by a prominent electrical engineer of extensive mining experience, who says: "Locomotive manufacturers were slow to design their locomotives to accommodate sufficient battery capacity. But, in my opinion, wherever the storage battery locomotive has failed there has been misapplication." He found in seven years' operation of seven locomotives of this type that the maintenance cost was practically confined to minor mechanical troubles.

What about the cost of an industrial locomotive—steam, gas or electric? This is no place to quote prices, and besides the only sensible answer to that question is the one that a manufacturer of gasoline units makes in his advertising: "You simply can't judge the actual value of a locomotive by its first cost—it's the service it renders that counts the most in the long run."

Roads In Canada

WASHINGTON, July 28.—Public highway work authorized in Manitoba, Canada, during the balance of the fiscal year amounts to about $566,500, according to Consul General Brittain. A number of concrete bridges will also be constructed.

Consul Felix S. S. Johnson, Kingston, reports that preparations are under way at Campbellford, Canada, for the construction of a $500,000 power plant. Plans for the extensive development of the water power in this district are being made in order to provide for the future needs of Central Ontario.

The cut and dried method of using rough faced block is shown at the left. At the right an attractive example of broken Ashlar design.

Surface Finishing Concrete Building Units

By A. J. R. Curtis

Perhaps no operation connected with the manufacture of concrete has been so often poorly done as the surface finishing treatment of concrete block. Fortunately, this does not mean that it is either expensive or difficult to produce permanently pleasing surface effects on block and other precast building units, but careful attention to process details is absolutely imperative.

The leading objection to concrete block and, in fact the only serious one, has been raised against the characterless and generally displeasing surfaces, frequently produced. Chief among these is the "rock face" or imitation rough pitched stone surface, seldom anything but a poor reproduction of the poorest looking and cheapest method of dressing natural stone. Even high grade "rock face" work is inappropriate to ninety-nine out of a hundred jobs, and it would be hard to picture a situation where a good flat surface would not look better. Perhaps an exception should be taken in favor of the "rock face" units of varying sizes as used in the broken ashlar surface shown in Figure 2. The variation in block sizes and the irregularity of the joints adds considerable interest, although they also add somewhat to the cost of making the block and laying them.

Other face plate surfaces which have attained more or less popularity are the paneled (Figure 3), bush-hammered and flat corrugated designs; when well executed any of these produces far better effects than the imitation rock face. However, their use is only occasionally justified since block with plain, flat surfaces, sharp square corners and straight edges are less expensive to produce and meet the requirements of the ordinary wall unit. In the opinion of most people, well executed work in exposed-face block of good quality has a great deal more character and interest than has the average stucco surface, although portland cement stucco seems to be the most economical of the better class concrete surfaces.

Rough, Flat Surfaces Are Best

Flat block surfaces should have a texture at least as rough as that shown in Figure 5. Smoother surfaces are to be avoided since they are likely to hair-check. The steel trowel must not be used on block faces for it will attract to the surface fine particles of the mixture, including the cement and smaller particles of sand. In such case the rich surface mixture has a rate of expansion slightly different from that of the backing and this difference is generally supposed to be the chief cause of hair-checking.

There are several satisfactory methods of producing special aggregate facings with block machinery of various types. The Hydro-Stone method produces block face up and after filling the mold box to the proper height with backing mixture, the top is struck off and half an inch of rich special aggregate facing of medium wet consistency is placed in the top of the mold box. The box then goes under the press. Tamp process machines all mold block face down or face to the side. In the "face down" machines a ¾-inch bed of relatively dry facing is placed on the face plate and the mold filled at least two-thirds full of backing mixture before any tamping is done.

Tamping machines which have face plates on the side require the use of a spacer to separate the facing from the backing until both facing and backing are in place and are rather unhandy to use where the tamping is done by hand. The

At the left is shown panel faced block in which prominence is given to the joints making a less attractive appearance than flat faced block. At the right is shown a combination of two or more block faces which is not recommended as a more pleasing appearance would be obtained by using flat faced block throughout.

Showing the beautiful surface texture obtained by the use of the mixture mentioned in the accompanying article.

spacer is practically an impossibility with power tampers and special facings are seldom, if ever, attempted on either side face power tamp or "stripper" machines.

Some of the wet mold or cast stone systems make their faced block with face up in gang molds. First they deposit the backing mixture wet enough to flow to all parts of the mold and after a short interval supply a somewhat drier top of special mixture, bringing it to a true plane by use of a heavy roller, rolled over the top of the entire gang. This is often followed with a certain amount of careful trowelling with a wooden float or a small wooden trowel covered with carpet or burlap or with brushing by a small brush or broom. The end faces of corner block are produced by substituting small concrete slabs for the mold end gates. These end slabs are cast separately in small molds and are about an inch thick, half the thickness being in facing and half in common backing. The end has a small piece of wire embedded in it, the ends of which extend into the mold box and anchor the end slab firmly to the body of the block.

The most commonly used facing process for wet mold systems is known as the Zagelmeyer process. The gang molds to which this method is applied make the block face down. The face plates are painted with a thin glue which is soluble in water. Dry facing mixture, usually consisting of mica spar, granite and marble particles, are sprinkled on the glue. After a short interval, to allow the surfacing to become well attached to the glue, the molds are filled with a regular backing mixture usually mixed just wet enough so that it will flow through the mold. At the end of twenty-four hours steam curing or forty-eight hours natural curing under favorable circumstances, the block are taken from the mold and the surface scrubbed to remove the glue. Scrubbing is generally done just as soon as possible without injury to the block.

Facing Mixtures

Block facings of high quality are produced by means of a range of colored aggregates and mineral colorings listed in the accompanying table.

Mineral Pigments for Use in Coloring Concrete Block Facings and Portland Cement Stucco Mixtures

Color.	Approximate quantity of mineral coloring per sack of cement.
Pink	¼ pound red oxide of iron
Terra Cotta	½ pound red oxide of iron
Light brick red	1 pound red oxide of iron
Red	1½ pounds red oxide of iron
Gray	2 ounces carbon black
Light Buff to Yellow	1 to 2½ lbs. iron hydroxide
Brown	1 to 2½ lbs. brown oxide of iron
Blue Slate	⅛ lb. (2 oz.) to 1 pound lamp black or manganese dioxide

This block produced by method of applying stucco to the individual block.

Pigments are sparingly used in block faces and wisely so, since they are not absolutely permanent in shade, although those given above all "weather" pleasingly. Yellow iron hydroxide is one of the most popular and least objectionable coloring materials since a warm buff tone can be secured with the use of but a small quantity and the color produced is one which weathers well.

Facing mixtures must be sufficiently dense to be water-tight, but an excess of cement and fine aggregates is to be considered an invitation to hair check unless greatest care is taken to make the mixture dry enough so that it cannot flow, avoiding the use of steel trowel and curing thoroughly in a moist warm atmosphere. Ordinarily these mixtures contain about one part of grey or white portland cement to about 2½ or 3 parts of aggregate. Best textures are obtained when there is a deficiency of very fine particles of aggregate and a predominance of particles varying from ⅛-inch to 1/32-inch in size. For best texture effects particles larger than ⅛-inch should be used cautiously.

No attempt will be made here to advise exact formulæ for producing various color and texture effects, since the possibilities for the production of fine surfaces are almost limitless, as experimentation within the range of available materials will show. The finer material in the aggregate is usually marble screenings or white or quartz sand. Marble screenings can be depended upon to lighten the color of the work, at the same time imparting a sparkling marble texture. Limestone screenings are used occasionally where marble is considered too expensive, but they are inferior in every way, giving a rather flat appearance to the surface. Lime in the surfacing produces similar results. For pure white and delicate tints, white portland cement may be used in preference to gray portland.

Three beautiful block faces produced from mixtures of (top) white cement, white sand and white marble chips; (center and bottom) white sand and grey cement, marble screenings, black and white marble and mica spar.

Interior of shop making high grade cast stone showing manner in which fine surface mixtures are backed with dense concrete mixtures.

R. F. Havlik, engineer in charge of the extensive building operations at Mooseheart, near Aurora, Ill., writes as follows:

"* * * we use one part of cement to two parts of granite composed of equal parts of Nos. 3, 3½ and 4 Crown Point Spar, for the facing of all our concrete block and trimstone. For ordinary concrete we use one part of cement to about three parts of sand and four parts of gravel. Our sand and gravel is washed."

This facing has been used very successfully in several hundred thousand block used in constructing some sixty buildings at the institution, as well as a variety of ornamental products.

An extensive manufacturer of granite surfaced block which have been used in high class construction work in St. Paul, wrote a short time ago:

"We have used mica spar crystals very extensively for quite a variety of building types. As a rule, we like a rather coarse texture for large houses, apartment buildings and commercial buildings. The particular face we recommend for such use is made up of 50 per cent No. 2 and 50 per cent No. 3 mica spar, with sufficient No. 5 to fill the openings in the other mix. Our method of handling this facing material is to glue this mixture on the face plate, back it with a half inch of neat cement, either white or portland, and then pour the regular concrete mixture for the balance of the block. For smaller buildings we would recommend a face material made up of 50 per cent No. 3 and 50 per cent No. 4 mica spar crystals instead of the larger size as recommended above."

A mixture of 1 part white cement, 1½ parts white sand and 1½ parts granite or marble chips ranging from 1/16-inch to ¼-inch in size, is recommended by one of the large cement manufacturers as giving a most attractive surface. The color produced by such a mixture obviously will depend entirely on the color of the larger particles introduced.

A Wisconsin manufacturer favored with clean well graded sand and gravel, buff in color, produces a good flat stone facing with a mixture of one part well graded coarse sand, one part fine sand, one part No. 6 mica spar and one part gray cement. The same manufacturer produces a high grade gray granite facing with a mixture of two parts No. 3 mica spar, two parts No. 5 mica spar and one part No. 6 mica spar mixed with one part gray portland cement.

Curing

Curing may be defined as a method of hastening the hardening of concrete by exposing it to a moist, warm atmosphere. The warmth hastens the reaction between cement and water and the moisture in the air prevents the heat from absorbing moisture from the concrete. Steam curing has proven the best method for hardening concrete block, fully as good results being attained by this method in forty-eight to seventy-two hours as by natural curing in three weeks. Steam curing also bleaches the block noticeably to a color somewhat lighter and more even than obtained by the ordinary method of exposing to moist air.

Chambers for curing by steam are made in a variety of shapes and sizes. A small temporary outfit may be made by arranging a canvas hood large enough to enclose the pieces to be cured, exhausting wet steam under the canvas but not directly against the concrete. Established concrete products plants usually employ long low

At the left an attractive residence using flat faced block of rough texture with flushed joints. At the right an inexpensive cottage at Madison, Wis., made of grey cement with a flat face and an attractive local sand.

The dwelling shown at the left is in the rebuilt portion of Halifax and is built of a combination of granite surfaced block with stucco on block construction. At the right a structure on the Catskill water system in New York City. Here the blocks are varied in color by slight changes in mixtures and curing.

tunnels into which the steam is admitted from holes in the bottom of a long steam main, often laid in a trough in the floor.

Cleaning and Finishing

The surface of concrete block usually has a filmy appearance when taken from the mold and the proper display of the larger particles is only attained by washing or etching out the fine particles of cement and aggregate. While the concrete is quite green within the first few hours after removal from the mold, a fine spray of water shot at 40 pounds pressure through a fog nozzle is often effectually used. A one to ten mixture of muriatic acid and water may be successfully used while the block are still green, but as they grow harder, the acid solution must be made more concentrated. Solutions of 1:3 and 1:4 are necessary in some cases, and are applied with a calcimining or other large brush. After the etching has progressed as far as desired, the surface of the block is scrubbed and rinsed with clean water.

Fine concrete block surfaces may be tooled or ground and polished in the same manner as monolithic surfaces and such treatment, when well handled, usually gives very fine results. Figure 13 shows an excellent example of hand-tooled block. The block must be allowed to thoroughly cure and harden before tooling or grinding. while less expensive proportionately than tooling or grinding of natural stone or monolithic surfaces, the application of this treatment to block is unusual because it costs more than the acid cleaning and when well done the latter acceptably meets almost all requirements. No matter what method of finishing is selected, it is possible with a factory-made unit such as block, to apply the treatment uniformly and at the most opportune time.

Mortar Joints

The appearance of any concrete block wall or pier is helped materially by the right kind of mortar joints. In practice the thickness of the joint is really a function of the length of the block. To allow for the slight inaccuracies of the block, the horizontal joints must be at least a quarter of an inch thick where block 16 inches long are used. If the block length is 24 inches, the thickness of the horizontal joint should be increased proportionately to ⅜ inch. The perpendicular joints correspond with the horizontal joints as to thickness.

Although there are a variety of styles of joint in use, the concave struck joint, made with a circular striking tool with curvature on one-half-inch diameter, produces a very attractive weatherproof joint. Ordinary struck joints made with a trowel are usually satisfactory but not so trim in appearance. The same might be said of the flush joint.

Gate posts with beautiful surface texture obtained by the use of highly colored gravel in the facing. The joints are purposely made invisible.

The color of the joints should match the block, but there is a diversity of opinion as to what constitutes a "match." Very pleasing effects are obtained by adding mortar to a white mortar base until a tint corresponding to the color of the block—either a little lighter or a little darker than the block—is secured. Only portland cement mortar should be used, mixed with about one part grey or white cement to two parts sand. No lime should be used in mortar for the surface block, since it may stain. For mortar of pure white or very light shades there is an advantage in the use of white cement; however, for the usual run of mortars of darker color, sufficient white often can be obtained by the use of white sand or marble dust with gray cement, which is more economical than the white. With the color of the mortar for a given job once determined, care is necessary to mix succeeding batches exactly alike, preserving a uniformity of color in the joints.

Mortar for use in laying up concrete block and similar products is mixed thicker than ordinary brick mortar, since the block are considerably heavier for the space occupied than brick, and are likely to force out thin mortar. In order to make sure that no parting occurs between block and mortar in the perpendicular joints, the block should be moderately moist when laid and both ends buttered.

Cleaning the Wall

As soon as possible after the wall is erected the exposed surfaces should be cleaned to remove all mortar, dirt and stains of one kind or another. The longer the period before cleaning, the greater the effort required. Fins and irregularities, chunks of mortar and other foreign material are first removed with a stiff wire brush. A solution of 1:4 muriatic acid and water is then painted on with a calcimining brush and followed up after a short interval by scrubbing with clear water. The time the acid solution is allowed to etch the surface before the water is applied can be determined by the operator without difficulty.

Limestone Screenings

WASHINGTON, July 28. — Limestone crushed to the consistence of sand grains may be used as a substitute for sand in mortar and wall plaster, according to the Department of the Interior, which has, through the medium of the Bureau of Mines, conducted a general study of the utilization of waste rock at lime plants. The superiority of crushed limestone over clean sharp silice sand is doubtful, but in regions where natural sand is scarce the substitution of a limestone product may be justified. Limestone screenings are used with success as fine aggregate in concrete for various purposes. Concrete brick, both common and face brick, are manufactured with limestone screenings as aggregate and are said to give satisfactory service in house construction. Limestone screenings without a binder are used for station platforms, the loose nature affording good drainage while a firm, compact surface is formed by the footsteps of travelers and the wheels of baggage trucks.

Important Reductions in Cement Rates

A Downward Readjustment of Freight Rates From Central Western Cement Mills Ordered by Commerce Commission

WASHINGTON, July 28—The Interstate Commerce Commission has ordered a downward readjustment of freight rates on cement from mills in Missouri, Illinois and Indiana to destinations in Illinois, Indiana, southern Michigan and southern Wisconsin, effective not later than October 12.

The commission held that rates within Illinois and Indiana prescribed by the railroad commission of those states were unduly prejudicial against cement made in other states and ordered the abolition of the state-made rates. It ordered that for them should be substituted a mileage scale which will give rates in Illinois, Indiana, southern Michigan and southern Wisconsin but little higher than those now in effect in those states. Indiana rates will be reduced by the order.

The proceedings were brought by the Atlas Portland Cement Company against the Burlington and other railroads. The commission in the same decision acted on complaints involving similar issues brought by the Universal Portland Cement Company and the Missouri Portland Cement Company.

The issues involved in the case are stated by the commission in its decision, which was written by Commissioner Daniels, as follows: "The questions presented for determination in these cases are: First, are the interstate rates on cement from Hannibal and St. Louis, Mo., and Buffington, Ind., to points in Illinois, and from Hannibal to points in Indiana just and reasonable; second, are the intrastate rates on cement in Illinois unduly preferential of producing points in that state and unduly prejudicial to Hannibal, St. Louis and Buffington and shippers therefrom; and, third, are the intrastate rates on cement in Indiana unduly preferential of producing points in that state and unduly prejudicial to Hannibal and the shipper therefrom. The authorities of the state of Illinois were duly notified of the hearings in Nos. 12710, 13061 and 13387, involving intrastate rates in Illinois, and the authorities of the state of Indiana were duly notified of the hearing in No. 12824, involving intrastate rates in Indiana. Nos. 12710 and 13387 were consolidated for hearing. The other cases, Nos. 12824 and 13061, were heard separately but have been consolidated with the first two named cases for the purposes of argument and of this report. Rates to the Chicago switching district, as defined in Lowery's tariffs, are not in issue from Buffington, but are in issue from Hannibal and St. Louis. The complaint in No. 13061, which places in issue the relationship between the rates from Buffington and the Illinois intrastate rates, contains no specific allegation with regard to the reasonableness of the rates from Buffington, but the reasonableness of those rates must necessarily be determined before a determination of the issue of undue preference and prejudice can be made. Only carload rates are involved."

In its findings the commission says: "It is probably true that as the regions to both sides of the Mississippi River become more homogeneous industrially, the less will the disparity in their rates levels become; but we are not persuaded that the restoration of a moderate difference between them as regards cement rates is not warranted by existing facts and conditions. As to the apprehensions entertained that such a readjustment will provoke additional complaints, we must therefore await the event; but a developing industrial region is bound to find certain long-established rate adjustments eventually outgrown and unsuitable, and permanent rigidity in rate structures is not to be anticipated.

"We find that the rates on cement from St. Louis and Hannibal to points in Illinois, from Hannibal to points in Indiana, and from Buffington to points in Illinois except points in the Chicago switching district are, and for the future will be, unreasonable to the extent that they exceed or may exceed the distance scale in connection with the carload minimum weight set forth below, which rates are found to be reasonable maximum rates. This scale reflects and includes the general reductions of July 1, 1922."

The Distance Scale

The distance scale of rates prescribed by the commission ranges from 6.5 cents per 100 pounds for five miles and less to 21.5 cents per 100 pounds for 700 miles. The rate for 100 miles is 9.5 cents, for 200 it is 12.5 cents, for 300 it is 15 cents, for 400 it is 16.5 cents, for 500 it is 18.5 cents, and for 600 miles it is 20 cents.

The findings continue as follows: "We further find that the circumstances and conditions surrounding the transportation of cement interstate and intrastate within Illinois and Indiana, from Hannibal and St. Louis to points in Illinois, from Hannibal to points in Indiana, and from Buffington to points in Illinois except points in the Chicago switching district are substantially similar.

"We further find that the rates on cement from Hannibal and St. Louis to points in Illinois, and from Buffington to points in Illinois except points in the Chicago switching district, are, and for the future will be, unduly prejudicial to Hannibal, St. Louis and Buffington and their shippers and unduly preferential of cement-producing points in Illinois, viz, La Salle, Oglesby and Dixon, and of intrastate traffic in Illinois to the extent that they exceed or may exceed the corresponding rates contemporaneously maintained for like distances upon intrastate traffic from said Illinois cement-producing points to said destination; and that any greater difference or disparity in the rates from Hannibal, St. Louis and Buffington, on the one hand, and said cement-producing points in Illinois, on the other hand, results, and would result, in unjust discrimination against interstate commerce from Hannibal, St. Louis and Buffington. The above finding is subject to the grouping of mills in close proximity to La Salle as hereinafter authorized.

"We further find that the rates on cement from Hannibal to points in Indiana are, and for the future will be, unduly prejudicial to Hannibal and its shippers and unduly preferential of cement-producing points in Indiana, viz, Mitchell, Buffington, Stroh, Speed's and Limedale, and of intrastate traffic in Indiana to the extent that they exceed or may exceed the corresponding rates contemporaneously maintained for like distances upon intrastate traffic from said Indiana cement-producing points to said destinations; and that any greater difference or disparity in the rates from Hannibal, on the one hand, and said cement-producing points, on the other hand, results and would result, in unjust discrimination against interstate commerce from Hannibal.

"We further find that in applying the rates prescribed or approved herein distances shall be computed over the shortest possible routes embracing as a maximum the lines or parts of lines of not more than three carriers via existing connections for interchange of carload traffic, and in the manner hereinafter set forth."

Rates Fixed on Relative Distance

Commenting on the general situation applying to rates on cement the commission says: "The rates applicable to cement are unique in that upon no other commodity of comparable importance and throughout so wide a sweep of territory have rates been fixed so sharply based on relative distance. This of itself impresses upon the cement traffic a distinctive stamp and differentiates its rates in a measure from other commodity rates. The keen competition of cement mills, many of them in near proximity to great markets, has reflected itself in our distance-scale rates. The jealous rivalry of La Salle mills is accentuated by the fact that on local movements to Chicago the rates exacted from Buffington are disassociated from other cement rates based on our scales, because the movement, actual or constructive, being within the Chicago switching district, is held to be immunized to our distance scales which apply to line-haul traffic. We do not see that it would necessarily follow that raw materials and other traffic moving into Buffington or the contiguous region of the Chicago switching district would, by reason of our finding herein, have to bear other rates than at present.

"It is urged that, if Buffington rates be based on the short-line distance from the mill, traffic may be teamed or trucked to other points in the Chicago switching district, and shipped therefrom at different and lower rates. It is similarly urged that cement may be brought into Chicago by water, or moved into downtown warehouses by rail, and that outbound movements thereof to points outside the Chicago district would be on different rates than would apply from Buffington. When and if that situation arises, and should its magnitude or frequency prove important, we shall be confronted in more acute form with the problem whether traffic outbound from the district shall carry different rates. We are not persuaded that the contingency is here, and shall not anticipate the difficulty until it arises. At present Buffington is the only producing point in the district.

"The chaos which it is alleged must result from our finding herein is, we think, largely overdrawn. There are exceptions now to the flat Chicago rate. Coal and livestock are not subject thereto, and some carriers that oppose the proposed invasion of the flat-rate system have only recently proposed to discontinue or curtail their absorptions of other lines' charges on the movement of ice into the district.

"The argument that the location of the cement mill at Buffington was based on the belief in the unbroken maintenance of the district rate is not persuasive. Rights to

interstate rates are determined by and under the interstate commerce act.

"We are asked to notice that cement shipped, from La Salle for instance, could move to any point in the district on the flat Chicago rate, irrespective of the place of its eventual delivery. The record, however, supports the view that the greater part of the inbound movement is delivered from the tracks of the in-bringing carrier. Some may be in the center of the city, some at distances therefrom, and the flat rate inbound is an average or equalizing adjustment. On the contrary the fact is that on the great bulk of the cement shipped out of the district, the origin of the movement is substantially distant from the center of the city; and that to markets north and west the short-line distance from Buffington is substantially greater than if the distance were calculated from downtown Chicago. Where to the east or south the short-line Buffington distance is less than figured from downtown Chicago, the Buffington mill will enjoy correspondingly lower rates.

"The situation before us is severely practical. To Illinois markets outside Chicago the rates from Buffington and Illinois mills, if they are to be put on the basis of maximum equality, must take rates measured by the same test of short-line distance. That the Buffington competitor chances to be located near the southern extremity of the Chicago switching district should not accord it either the benefit or disadvantage of a constructive mileage.

"We find that the proper measure of distances from the Buffington, Hannibal and Illinois mills to the destination territory involved in these proceedings is the distance from those mills, except that the mills in the vicinity of La Salle, including those at Oglesby, Deer Park and Utica, may be grouped and a common rate applied therefrom. The Dixon mill should be separately treated."

Explaining the refusal to grant a request of railroads serving Chicago from the Illinois cement producing points the commission says: "The carriers serving Chicago from the Illinois cement-producing points, while advocating original Scale II rates, plus 2 cents, plus 35 per cent, for general application in Illinois and Indiana, urge that we authorize the establishment of a key-point rate from those mills to Chicago not in excess of the intrasate rate, which since July 1, 1922, has been 8 cents. This request, which is supported by the Illinois mills, is based on the assumption that if the rate from the Illinois mills is placed on the interstate scale the alleged disproportionately low rail rates from Buffington will force those mills out of that portion of the Chicago market, from which they have not already been excluded by auto-truck competition from Buffington. The interstate rate from La Salle to Chicago since July 1, 1922, has been 11 cents, and under the scale herein proposed would be 9.5 cents. From Buffington the rates are 6.5 cents for industry delivery and 7 cents for team-track delivery, which rates, as stated, are not here in issue.

"The carriers serving Hannibal also ask for a key-point rate from Hannibal to Chicago relatively equal to the key-point rate sought from the Illinois mills to Chicago. The rate from Hannibal to Chicago, since July 1, 1922, has been 15.5 cents. Prior to the establishment of rates under the decision in the *Western Cement case*, from 350,000 to 500,000 barrels of cement per annum were shipped from Hannibal to Chicago. With the application of the rates prescribed in that case and the widening of the differentials against Hannibal, brought about by the percentage increases, Hannibal has been practically excluded from the Chicago market. The Hannibal complainant, while not specifically advocating the establishment of a rate to Chicago lower than the scale rate, urges that, if a key-point rate be established to Chicago from the La Salle mills, like consideration should be given the Hannibal mills. The St. Louis complainants urge that if key-point rates be established from Hannibal and La Salle, St. Louis should also be accorded a key-point rate lower than the scale. The St. Louis mills do not expect to market cement in Chicago but desire a key-point rate established for the effect it will have on rates to intermediate points.

"The necessity for adhering to the scale rates has been adverted to. Were we to grant the requests here made for the establishment of key-point rates materially lower than the scale, it would open the door for other requests of similar character and would be a retrograde step toward conditions which the general cement investigation was designed to remove. The requests for key-point rates lower than the scale will therefore be denied."

Commissioner Hall, dissenting in part from the decision of the commission, made the following comment: "The finding of undue prejudice in the relation of intrastate rates to interstate rates is far too sweeping. The intervening cement manufacturers in Illinois and at Mitchell have made this plain, as recited in the report. Buffington, Ind., affords another illustration, served as it is by defendant carriers, none of which reaches any of the 'preferred' Illinois mills or controls the rate from those mills. General admissions that rates should be on the same level do not establish undue prejudice and undue preference under section 3 of the interstate commerce act, or call the exercise of Federal power to prescribe intrastate rates."

The Federal Aid Road System

WASHINGTON, July 28.—An announcement by the Bureau of Public Roads of the Department of Agriculture states that roads that will comprise the federal aid system of highways have been definitely designated in thirty-four states.

More than ninety per cent. of the entire population of the United States will live within ten miles of a federal highway. In a number of states the figure is as high as ninety-eight per cent. and in none of the states will it drop below sixty-five per cent. Nearly every city of over 5,000 population is located upon the system of federal aid roads and the few that are not will connect with it over improved roads.

The following tabulation shows the mileage in the system by states, estimates being given for those states whose systems are not yet approved:

	Federal Aid System
Alabama	3,958*
Arizona	1,498
Arkansas	5,037*
California	4,467
Colorado	3,360
Connecticut	835
Delaware	266
Florida	1,855
Georgia	5,662*
Idaho	2,772
Illinois	4,987*
Indiana	3,957
Iowa	7,154
Kansas	6,423
Kentucky	3,250
Louisiana	2,667*
Maine	1,393
Maryland	1,036
Massachusetts	1,290*
Michigan	4,582
Minnesota	6,801
Mississippi	3,290*
Missouri	7,040
Montana	4,697
Nebraska	5,500
Nevada	1,456
New Hampshire	988
New Jersey	983
New Mexico	3,258
New York	4,498
North Carolina	3,816
North Dakota	4,855*
Ohio	4,506
Oklahoma	7,889*
Oregon	2,814
Pennsylvania	3,954
Rhode Island	165
South Carolina	3,179*
South Dakota	8,077*
Tennessee	4,564*
Texas	11,655*
Utah	1,430
Vermont	1,043
Virginia	3,016
Washington	2,887
West Virginia	1,901
Wisconsin	5,516*
Wyoming	3,234
Total	187,406

* Mileage given is an estimate, as system is not yet approved.

Secretary of Agriculture Wallace has approved expenditures of $390,900 of the forest service road funds, principally from the forest highway fund, for the construction of about 106 miles of highway in Idaho. The highways are located in or adjacent to the national forests in that state.

Among the projects is the Coolwater section, a five-mile stretch, of the Lolo Pass road, for which $9,000 of forest highway funds was approved. In addition to this amount, $166,000 from the forest development and federal forest road construction funds which had been allotted to the Powell section of the Lolo Pass road will be transferred to the Coolwater section, inasmuch as this amount cannot be expended upon the Powell section this year.

For surfacing that section of the North Pacific highway which runs between Cataldo Bridge and the Green Schoolhouse, a distance of a little over seven miles, the sum of $39,500 has been alloted from the forest highway fund.

The sum of $44,000 from the forest highway fund was approved for surfacing work on that section of the North Pacific highway which runs between the Cataldo section and Wolf Lodge trestle, a distance of fifteen miles. In addition the state of Idaho will allot $20,000 for this work, making the total $64,000.

Another surfacing job will be performed on the Kootenai-Pack River road between Hope and Pack River, a distance of about seven miles. The sum of $35,000 from the forest highway fund was approved for this work.

The sum of $40,000 from the forest highway fund was alloted to the Warren Wagon Road in Valley County between Station 58 and Station 812, a distance of a little over thirteen miles. The sum of $75,000 was heretofore appropriated for this project with the present allotment and a small sum from the federal forest road construction fund brings the total for this construction to $116,092.

For the 26-mile stretch of the Warm River-Yellowstone highway between the Montana state line and Warm River, the sums of $16,000 from the forest highway fund and $15,000 from the Section 8 road fund were approved. Local authorities offer an additional $15,000 toward the building of the project which with the $61,000 of federal funds previously appropriated brings the total for this project to $107,000.

Funds set aside last year for the section

(Continued on page 52)

Things That Make the Consumer Buy From You
II

By John Lee King

Just as a pair of lovers are likely to find that "the longest way round is the shortest way home" so we, in our search in the mind of the Ultimate Consumer for those things that will make him buy from us will find that we often succeed better by going far afield. Hence in this second article we will go back into the life of that Ultimate Consumer to the days when his mind was just being formed and see whether or not we can find something of value to us in our efforts to win his patronage.

Perhaps we will be taking liberties with privacy if we wait outside the door of the room into which he is being born, but, since he is too small to know about it, he will not hold it against us or take his trade to our competitor. So let us wait and see what happens. The doctor comes out and announces that this particular Ultimate Consumer is a boy or a girl, as the case may be—for our purpose, it makes not a bit of difference. The thing that interests us is what happens to him after he is born. For what happens to him will be to a large extent determine what will be the influential things in his life thereafter.

The nurse gets busy and bathes him, shortly his mother nurses him, shortly his linen is changed for him; he has but to whimper to get somebody active in his behalf. If he cries, somebody picks him up; if he smiles, somebody points a finger at him and says "Goo." He is the lord of the world in which he lives; he is a monarch whose every wish is law. And, say, but he loves it.

And this young monarch, grown large, is that same Ultimate Consumer who will some day walk into your place of business and patronize you, or else will walk past your shingle and take his money elsewhere. Isn't it worth while to watch him grow apace?

He gets so he can creep; he has outgrown the rattles that were given to him without any expenditure of effort on his part; he is kept in clean linen although it means changing clothes three or four times a day and a mother washing and ironing so continuously that she could do it in her sleep. His food is cooked for him, his bed made, his toys acquired, and all without taxing his strength or effort one iota. A king could ask no more.

Then off to school he goes where teachers spend their days giving him of their store of knowledge. When he cannot work a problem, they help him; when Latin looks like Greek they turn it into English for him.

True, as he goes along, if he is lucky, he acquires each year a little more responsibility to prepare him for the responsibilities that will come when he is full-grown, but don't you think for a minute that he doesn't carry a cheerful remembrance of the days when it was not his to do, but to be done for. And whether he be boy or girl, President Harding or the sister of the boot-black down at the barber-shop, he likes still to have things done for him. Whatever else may or may not be found in the mind of the Ultimate Consumer of Portland, Ore. or Portland, Me. you bank your bottom dollar that there is a good space taken up with that liking to be served.

There, we've used the word at last. Business sermons by the hundreds have been written on "service," yet many business men accept the word as a meaningless expression which sounds well and has done its duty by mere expression. Companies put it into their advertising and forget to put it into their actions, overlooking the fact that every one of their customers was raised on service of the first quality because it was mother-service, and that ever since the day they left home they have been looking for the same kind of attention more searchingly than even Diogenes, with his lantern, looked for an honest man. And should they find that quality of service in their dealings with you you've a customer for life.

There are a few things which are commonly listed as good service: prompt deliveries, the keeping of promises, courtesy in the treatment of customers, exact care in rendering accurate bills, selling goods for what they really are and not on the basis that Barnum found the world running in the day of his successes; strict honesty in all dealings. Many of these things—most in fact—are given by the majority of merchants today for the simple reason, if for no other, that men have learned that without them business is bound to die.

But if it is service that the Ultimate Consumer wants and he shows a particular liking for real service, then it may be worth our while to discover if we can how that service can best be rendered. It is more than doing certain things; it is doing certain things in a certain manner —a manner that pleases and rubs the fur of the customer the right way. What was there in the services that his mother used to render that makes them so comfortable to remember? It was certainly more than the acts themselves; if these had been performed by a servant they would not have persisted in their hold on him.

It was, it seems to me, the fact that the services were rendered with pleasure; that the child as he grew realized that his mother loved to render them as greatly as he did to receive them; it was this, and this alone, that made them so enduring in his memory. And the business man who can render service to the community collectively and individually as members of it come to him to buy, and can render it with a spirit of liking the job, is the fellow who gets the lion's share of the trade. "If you would be the master of men, serve them" can readily be paraphrased into "If you would have the patronage of men, serve them cheerfully."

Several examples of what I mean come to my mind. There is an optician whom I patronize who has the happy faculty of conveying to each of his customers the idea that he lives only to serve them; he does his job willingly and pleasantly and he has a growing clientele for he does not lose any of his customers as the years go by. Of course his services give satisfaction; he fits eyes carefully, and grinds his lenses exactly, but this alone would not build his trade or hold it. It took personality and a real joy in his job to do that.

And there is where so many men make a mistake. They find themselves in a particular business, and it is irksome to them. But they hold on, grumbling to themselves and to their wives about the distastefulness of their lot. And they wonder why their business does not grow and prosper; they are apparently giving good goods for the money they take from their trade; they add service, and why do they fail? Because, unwittingly, that spirit of discontent seeps through their armour of apparent service and the Ultimate Consumer does not enjoy his transactions with them. The same business men, shifted into other businesses, might easily make phenomenal successes, merely because they would find themselves in a niche where they enjoyed every hour.

And if you who are reading this article do not find complete satisfaction in your cement business, it seems to me that you will do well to consider in what business you will find contentment and then jump out of cement into that other activity as soon as possible. For certainly there are plenty who find the handling of cement, the building of a better world with it, or their part in it, to give complete service to the Ultimate Consumer. And against such, you, if you don't like the job haven't a chance in the world.

As in the previous article, I would suggest that you examine your own mind to learn what things you like in the people you patronize; what it is in their service that pleases or displeases you, for, after all, your rearing and consequently your mind, is about the same as those who you wish to patronize you. You will learn much from such reflection; you will realize that you take your business to those persons who make your dealings with them a pleasure; who serve you in such a way as to leave you with the feeling that you have done them a service, rather than the other way round.

And then, to wind up, I would leave with you the idea that one of the things that will make the consumer patronize you is service—service of the old home-made variety that greases the wheels of business without letting the consumer see the grease. And if you give your community that kind of service, there'll be profits in it, and joy in it, and permanency in it—all of which will grow and multiply as the years roll round.

Concrete Road Tests

WASHINGTON, July 28.—Methods of curing concrete road slabs are being tested by the Bureau of Public Roads of the Department of Agriculture at its Arlington Experimental Station. A number of 6-inch slabs, beams for breaking by bending, and compression specimens have been cast with 1:2:4 concrete using gravel aggregate. One set of specimens has been air cured while others have been cured under wet sand, wet earth, tar, asphalt, other coverings and frequent sprinkling with no cover.

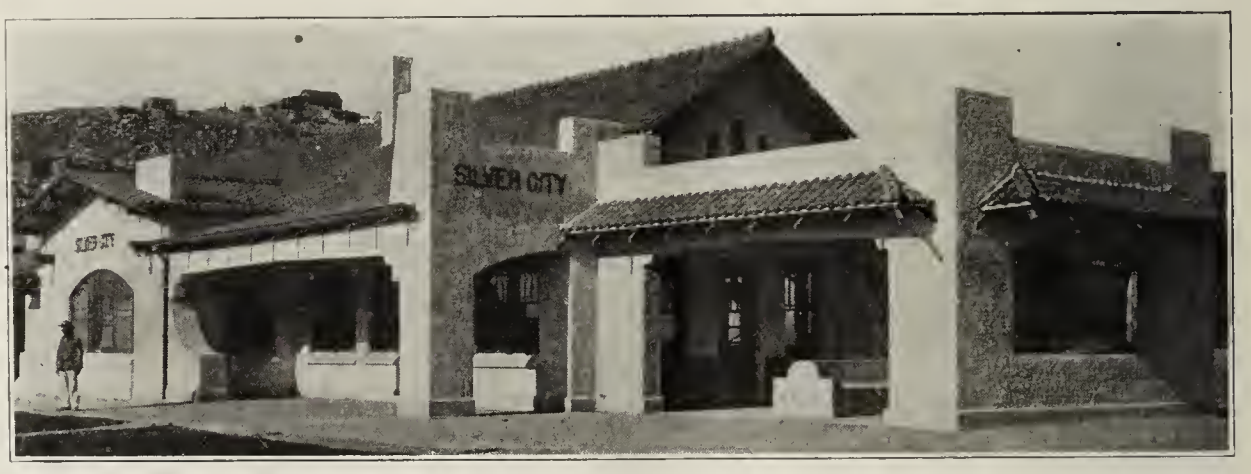
Twenty-eight-day tests will be made on the bending and compression specimens and on cores cut from the slabs and at frequent intervals additional compression tests will be made on cores from the slabs.

Ornamental Stations of Cement Construction

The A. T. & S. F. Railway engineers have been very successful in the use of concrete and stucco in making various station buildings along that great system. To the right we show the compact station of this railway at Porterville, Cal.

At Amarillo, Texas, the station is built of monolithic concrete with concrete tile roof, the trade mark of the company being placed immediately over the station name in the center. This is one of the finest stations on the entire system.

At Silver City, New Mexico the station is of stucco on brick with a clay tile roof. This building is in marked contrast to the structures on the hill in the background.



The people of Kiowa, Kansas are proud of their station which is made of pebbledash rough cast. The building is one of the most beautiful in the community.

Ponca City, Oklahoma may also lay claim to having a beautiful and splendid station. The station proper and the service building containing the baggage room are in harmony and the whole makes the building one of which any city might be proud.

A Study in Coloring Cement With Pigments

A German Writer Discusses Recent Developments and Facts Discovered in Tinting Cement Work

By F. A. Brackmann

The coloring of cement is everywhere receiving the attention of manufacturers in this industry, but the great number of bad tiles and other cement products to be seen show that a lot of firms are not quite familiar with the properties of the colors they are using. Cement has been standardized, and its properties have been studied in all its details, but with regard to the colors little headway has been made. Some interesting articles on this subject by Dr. Platzmann, are being published in several trade papers in Germany. He is advocating the establishment of an authoritive committee for the study of the coloring problem of cement and cement products, and for the standardization of the mineral colors. He claims the cement industry, as well as the laboratories in these lines should be represented in the committees. He also makes some proposals in regard to the working out of directions to determine the origin and the properties of colors to test and use in lime and cement.

An analysis of colors should be made, both physically and chemically. Besides the chemical properties of a color there are several other points of a more mechanical and technical nature which influence its quality. The fineness of grinding, constancy of volume, the tendency to efflorescence, resistance against the cement, ability to keep the original tone, the power to color, and indifference to the weather are some of the points that have to be observed in determining the quality.

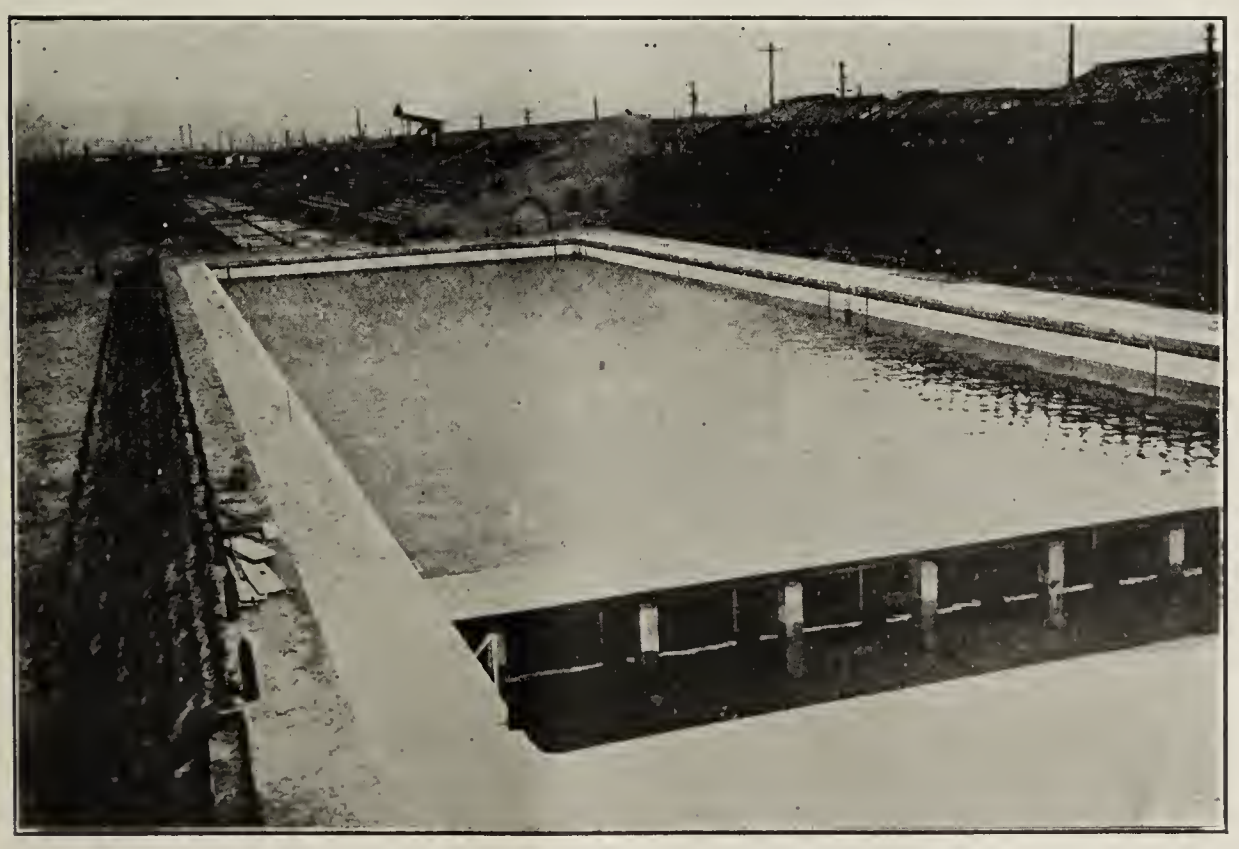
The finer a color is ground, the greater is its coloring ability, and its proportion to the cement can be reduced with increasing fineness. To insure a thorough mixing, the color should at least be of the same fineness as the cement. This is easily tested with the usual sieves.

It must also be proved whether the color is detrimental to the constancy of the volume of the concrete, as is often the case if it contains plaster of Paris or a great part of sulphur trioxid. This may readily be ascertained by mixing five parts of sound cement with one part of color and about 24 to 32 per cent of water to a tough paste which is tested in the ordinary way.

To test the tendency of a color to efflorescence, a paste is made of it with distilled water. After the evaporation of the liquid, efflorescence will appear at the edge if the color is of inferior quality.

Its ability to resist the action of the lime, the alkaline ingredient of the cement, is generally seen during the test for constancy of volume. A simple test can, however, be made by mixing two pastes of the same color, one with an addition of lime, and the other without, and observing the ultimate difference in the tone of the color.

Reinforced concrete arch at Charlotte, Eaton County, Mich.



Athletic stadium and concrete swimming pool at Tokio, Japan.

An examination in regard to durability under the influence of light takes some time, unless a special artificial light is at hand. With the addition of a little gum, the color to be tested is spread onto a piece of paper. One-half of it is put into a photographic frame and exposed to the sunlight. A difference in the two halves reveals after a time the inferiority of the color in this respect.

The following simple means has also served admirably in a lot of instances to judge the coloring ability. A color whose physical properties and analysis is known, is mixed with zinc-white in proportion of 1:0, 1:1, 1:2, 1:5, 1:10, 1:50, and is spread with a little gum onto a white sheet of paper. Other colors that are to be tested are made up in the same way, and compared with the standard preparation. Tests of resistance to weather take a long time, and are troublesome owing to the impossibility of observing all the varying conditions at the different times.

The second category of tests requires some knowledge of chemistry, and at least a small laboratory. Cement colors must be mineral colors, they should contain but very small quantities of surphur trioxid and chlorine ions, and should be insoluble in water. Organic colors may not be used as they cannot resist the action of the lime in the cement. Whether a color is organic or mineral is quickly determined by heating it on a sheet of platinum in the flame of a blow lamp. Mineral colors should not be volatile. Alterations in the tone or an entire change as takes place in the case of ultramarine, green, etc., is immaterial to

the test. Mineral colors may be pure earth colors or derivatives of such, which are either produced chemically, or from a by-product, or they are artificially assembled. Ochre and umber belong to the first category, iron-oxides to the second, and ultramarine to the third.

To examine the color for sulphates or chlorides, which may produce efflorescence and expansion, it is treated according to the respective salt it contains. Salts difficult to dissolve especially in colors mixed with gypsum, are rendered soluble with muriatic acid.

Soluble sulphates and chlorides are usually bound to the alkalies. Sulphuric acid is detected with barium chloride, muriatic acid with nitrate of silver. If the precipitation of sulphate of barium and chloride of silver is more than a slight cloudiness, the quantity has to be determined, which must not be more than 2.5 per cent of sulphur trioxid or chloride.

Alkalies or calcium are determined with the help of a spectroscope. In order to test whether a color will dissolve in water, it is washed in distilled water, heated to boiling, and filtered off afterwards. The filtrate should be colorless and leave no residues.

The analytical method of examining colors requires a well-equipped laboratory and considerable time, but gives valuable and reliable information about the respective colors. This is of importance as they are varying according to origin and manufacture, and the amount of gypsum, chalk, spar, brick-dust, shale, etc., that is sometimes added. Some manufacturers add considerable amounts of gypsum to their colors, especially to iron oxides, and some English-red colors which are made out of the residues of the vitriol and alum production, have considerable contents of sulphur trioxid. In all analyses the amount of silicic acid, alumina-ferric oxyde, lime, magnesia, sulphur trioxid, sulphide, and loss through burning has to be ascertained. Different colors require, however, special definitions. To determine the strength of ferric-oxide colors, the contents of alumina and ferric-oxide have to be determined. To precipitate the latter the Treadwell method with solution of potash or the method of titration is employed. Alumina is precipitated out of alkalic solution with ammonia.

Black manganese colors have to be examined in regard to manganous oxide with acetate of soda or hydrobromide. Ultramarine colors should only contain a very small amount of gypsum. With chrome colors the amount of oxide of chromium is to be ascertained. The solution contains the chrome in the form of alkaline chromate and is precipitated with nitrate of mercury.

The following table gives a survey of colors and the way to analyze them.

Name of color	Muriatic acid	Solution of caustic soda	Sulphide of ammonium	Burning
Red oxide of iron	slowly dissolv. yellow	yellow solution	turning black after long contact	dark brown
Ochre umber	dissolv. yellow, white residue	yellow solution	turning dark till black	red brown
Chromate of zinc	orange during boiling	dissolving	.....	pearl chrome
Coal black	unaltered	turning brown	unaltered	burns up
Ultramarine	color destroyed develop. sulphur, hydrogen	unaltered	unaltered	turns blue
Green oxide of chromium	slowly dissolv. yellow	unaltered	turning into a dull green	unaltered
Green earth	hot dissolv. greenish-yellow	unaltered	unaltered	red brown
Ultramarine blue	color fading, develop. of sulph. hydrogen	unaltered	unaltered	unaltered

The price of oxide of iron colors varies according to the contents of ferric oxide which are between 40 and 100 per cent. Ochre and umber are cheaper, as the cost of their production is low. They are, however, of comparatively little coloring strength. Zinc-yellow is very expensive and therefore seldom used. Ultramarine colors require careful handling when used with cement as they have a tendency to cause efflorescence.

Manganese black is produced from manganese ore, and coal black is generally powdered coal. The latter should be especially observed in regard to fineness, as an insufficiently ground color is apt to lead to efflorescence.

It is always risky to use ferric oxides with a lower content than 70 per cent. The higher the percentage, the less color is necessary with a certain mixture, and it pays with all colors to use a better grade and take smaller amounts if a lighter color is to be attained, instead of employing inferior brands.

As all colors, except the ultramarines, are decreasing the strength of concrete, this is another reason to employ only first class materials, as only a small quantity of them is required to achieve the desired coloring effect. The proportion generally used in Germany in the manufacture of roofing tiles is one part of color to six to eight parts of cement. The ultramarines increase the strength of concrete. They contain a comparatively large amount of soluble silicic acid which forms with the lime in the cement silicates. With cement insufficiently burned, the silicic acid is diminishing the possibility of efflorescence due to free lime.

Only a mechanical mixing of color and cement insures uniformity in the ultimate product. The water should not be added before the dry materials have been thoroughly mixed.

To Equalize Construction Work

WASHINGTON, July 28—A committee on seasonal operation in construction industries has been appointed by Secretary of Commerce Hoover from the membership of the President's conference on unemployment. The committee, which is headed by Ernest T. Trigg, a Philadelphia manufacturer, has held its first meeting. At this meeting, which took place in Atlantic City, the committee established a premise that seasonal building is due more to custom than to weather conditions and arranged to work out a plan whereby construction work will not be universally observed as seasonal but will be extended throughout the greater part of the year, with the consequent lowering of costs.

The committee expects to report to Secretary Hoover some time next winter a comprehensive plan for the equalization of construction work. It is hoped that the report can be made in time to be of some benefit before the beginning of the usual spring building boom next year.

Members of the committee besides Mr. Trigg are: John W. Blodgett, manufacturer, of Grand Rapids, Mich.; John Donlin, president, Building Trades Department, American Federation of Labor, Washington, D. C.; L. F. Eppich, president, National Association of Real Estate Boards, Denver, Colo.; A. P. Greensfelder, contractor, St. Louis, Mo.; John M. Gries, Department of Commerce, Washington, D. C.; Otto T. Mallery, public works expert, of Philadelphia, Pa.; Rudolph P. Miller, engineer, of New York; James P. Noonan, president, Brotherhood of Electrical Workers, Washington, D. C.; William Stanley Parker, architect, of Boston, Mass.; and Edward Eyre Hunt, secretary.

"Previous surveys have indicated that most construction activity is concentrated in seven to ten months of the year, which means that building trades workers cannot find work in their trade during several months, and that contractors' organizations and equipment, architects, engineers, building material producers, and others connected with construction, must usually remain idle for similar periods," said Secretary Hoover in announcing the appointment of the committee.

"The committee was formed in the hope that by examining the facts and proposed remedies, it might be able to suggest sound solutions, and obtain general co-operation in effecting them. It is the general impression that seasonal building has been due perhaps more to custom than to weather, and it is expected that the investigation will throw light on this and other important points."

The committee will undertake a study of seasonal construction of different kinds of construction work, showing the days of the beginning and the end of the normal season for types of construction work.

The survey will cover also seasonal production in building materials to determine how far this is due to seasonal building operations and trade customs and how far to climatic conditions. The committee will consider what remedies there may be for seasonal operation and by whom they may be applied. Remedies suggested include seasonal rates of prices, dovetailing of contracts, and a survey of housing needs.

Although climatic conditions in the south are more favorable in many sections in the winter than in the summer, members of the committee have observed that the chief building activity in southern cities, due to long adherence to custom, follows closely the same seasonal ups and downs as in the northern sections of the country.

Prevention of a repetition of the runaway market in construction, labor and materials which has developed this year is the hope of members of the committee. That this can not be brought about easily, however, is conceded. Changes in present custom cannot be made effective, it is stated, without far reaching changes in many allied industries, ranging all the way from transportation activities to the manufacture of materials.

Spreading of days for the termination of leases through the year is regarded as a step which would help in eliminating the seasonal character of the construction industry. The fact that leases now expire either on May 1 or October 1 brings to a peak the demand for repair work around these periods.

Standardizing Equipment

(Continued from page 31)

and the 21-E. Based upon 40 per cent of voids the sand and stone and a maximum of one gallon of water per cubic of mixed concrete, these sizes are to handle whole sack batches as follows:

MIX	NUMBER OF SACKS IN BATCH 7-E	12-E	21-E
1-1½-3	2	3	6
1-1½-3½	2	3	6
1-2 -3	2	3	6
1-2 -3½	1	3	5
1-2 -4	1	3	5
1-2½-5	1	2	4
1-3 -6	1	2	3

(b) There shall be four sizes of horizontal non-tilting type building mixers manufactured. Three of these shall be the 7-S, the 14-S and the 28-S, and the fourth shall be subject to future action in conjunction with the manufacturers of tilting mixers. Based upon 40 per cent voids in the sand and stone and a maximum of 1½ gallons of water per cubic foot of mixed concrete, the adopted sizes shall handle whole sack batches as follows:

MIX	NUMBER OF SACKS IN BATCH 7-S	14-S	28-S
1-2-4	1	3	6
1-3-6	1	2	4

It is recommended that a referendum be taken of the A. G. C. to determine whether the size 21-S is desired. If this size is desired, its capacity shall be a 4-sack batch of 1-2-4 mix and a 3-sack batch of 1-3-6 mix, based upon 40 per cent voids in sand and stone and a maximum of 1½ gallons of water per cubic foot of mixed concrete.

6. Standard Table of Batches: A standard table of batches derived from the table provided for under item No. 4 shall be adopted and published by the manufacturers. This table will show the size of batch of various proportions for each standard size mixer. The Standardization Steering Committee shall furnish the table.

7. Method of Measuring Drum Speed: (Double opening non-tilting drum only) (a) The speed of the drum shall be measured in terms of the peripheral speed in feet per minute of the center of mass of the water level content of the drum when stationary. Both this speed and the r. p. m. of the drum shall be given by the manufacturers. Application of this provision shall be subject to recommendation and approval of a committee consisting of the chief engineers of the following mixer manufacturing companies: Austin Machinery Corporation, Chain Belt Company, Foot Concrete Machinery Company, Koehring Company, Lakewood Engineering Company, the Marsh-Capron Company, Ransome Concrete Machinery Company, the T. L. Smith Company. It is recommended that state and municipal departments specify the peripheral speed of the drum as here defined instead of the r.p.m.

Standardization of Mixer Equipment

8. Building Mixers: (a) Extension power loaders shall be eliminated. (b) Mixers shall be equipped with tanks of sufficient size to deliver the indicated quantities of water per batch as follows: 7-S, 12 gallons; 14-S, 22 gallons; 21-S, 32 gallongs; 28-S, 42 gallons; 7-E, 12 gallons; 12-E, 22 gallons; 21-E, 32 gallons. Tanks shall withstand a working pressure of 150 pounds per square inch. One tank shall be standard. Water supply connections shall be furnished as follows: 7-S, three-quarter inch garden hose nipple; 14-S, one and one-quarter inch standard iron pipe connection; 28-S, two-inch standard iron pipe connection; 7-E, one and one-quarter inch; and 12-E, and 21-E, two-inch standard iron pipe connection. (c) Discharge control on one side only shall be standard but may be furnished on both sides as an extra. (d) Skips shall be made with closed ends. (e) Standardization of wheels shall be referred to the Mixer Association for further investigation and report. (f) Power discharge shall be eliminated as standard but the manufacturers may furnish same on 28-S and 56-S mixers as an extra.

Paving Mixers

(a) Only full caterpillar thread or four wheels shall be used on 12-E and 21-E machines, and four wheels only on 7-E machines. (b) Maximum width of skip four feet from end shall be 100 inches. (c) Power steering control shall be used in full caterpillar and hand steering on four-wheel machines. (d) Hand power boom swing only shall be used. (e) Maximum speed of travel of mixer shall be 1½ miles per hour and minimum ½ mile per hour. (f) The batch transfer derrick shall have a reach of 14 feet from center line of machine as standard. (g) Engine tools only shall be furnished on the 7-S mixer. On the 14-S, the 21-S, the 28-S and on all paving mixers, the manufacturer shall furnish all necessary special tools and a kit of standard tools to be agreed upon by the Manufacturers' Committee. (h) An auxiliary hoisting drum may be furnished only on the 7-S, as special equipment.

9. Shafts and Gearing: The sizes of shafts, keys, keyways, gears and the composition of gears shall be referred to the American Society of Mechanical Engineers for recommendation as to procedure in standardization.

10. Standardization of Power: The question of standardization of power with reference to requirements for different machines shall be referred to the A. S. M. E. for advice as to proper procedure.

11. Safety Devices: All working parts shall be guarded in accordance with the requirements of state laws. Paving mixers shall be provided with safety devices to protect men when the skip is being lowered.

12. Standardization of Names of Parts: The nomenclature of the Concrete Mixer Association, with additions recommended by the Manufacturers' Committee above named, to bring this nomenclature up to date, shall be adopted as standard.

13. Name Plate: A name plate giving the standard rating of the machine, its capacity for different proportions of mix and such other data as may be later determined, shall be affixed to each machine. A committee of three manufacturers shall pass upon the plate and manufacturers shall obtain the right to use this plate from the A. G. C. It is recommended that pending adoption of American standards, the plate states that the machine meets the standard A. G. C. requirements as approved by the joint committee of manufacturers and contractors.

14. Principles of Lubrication, Bearings and Anti-Rust Paint: The manufacturers shall fully, effectively and honestly set forth in their printed matter, information on the principles of lubrication, care and composition of bearings and material and the use of anti-rust paint as used in their machines.

The International Road Congress

WASHINGTON, July 28—Conclusions of the International Road Congress at a recent meeting at Seville, Spain, have been made public by the Washington headquarters of the National Automobile Chamber of Commerce.

The report of the Congress on the surfacing of roads with concrete was as follows:

"1. Cement carriage ways formed of materials of good quality in suitable proportions, built on sound and well drained foundations are capable, if the work is carefully executed, of withstanding considerable traffic of heavy vehicles fitted with rubber tires.

"2. Under the conditions and for the kind of traffic specified in the first conclusion, such roadways are stable in a variety of climates. They are smooth but not slippery, and the resistance they offer to tractive effort is slight. When worn, they can serve as a foundation for other types of surfacing. They are clean, give off little rust and allow water to flow away readily. The necessary materials are to be found in nearly all countries. Visibility is good during the night, and there is but little noise. Vehicles running on these roadways suffer little damage. Against this, their repair in case of severe damage is difficult; very great care is necessary in their execution, which demands close and constant supervision; traffic is necessarily interrupted for a considerable time. It is not easy to open trenches; when cracks occur, the appearance is unsightly.

"3. Further investigations are required as to the effect upon road surfaces of traffic consisting of a large proportion of tired vehicles.

"4. Materials for the concrete must be chosen with the greatest care. High grade cement should be used and clean water. The fine aggregate should be free from mud and organic matter, and only a small proportion of clay should be admitted; an excessive proportion of fine particles should be avoided.

"5. It is of prime importance that the concrete should be as compact as possible. As a general indication, based on previous practice and by way of rough approximation, one may quote the proportion in volume of 1x2x3½ or its approximate equivalent, viz: 400 kilos of cement to 540 liters of fine aggregate and 945 liters of coarse aggregate. In each case, trials should be made with the materials available, so as to decide the proportion which will insure a very compact concrete. If the surfacing is executed in two coats, the concrete for the lower layer may be poorer. The above quoted proportions only apply to Portland cement, the use of special cements may justify the adoption of different proportions.

"6. The bed or foundation must be drained and consolidated with the utmost care. Drains must be laid below the level to which frost penetrates and at depths dictated by the nature of the soil. Where severe frosts are frequent, it is well to amplify this precaution by placing beneath the surfacing a layer of non-conducting materials, such as coke, cinders, pulverized peat, etc.

"7. To obtain favorable results, it is indispensable to inspect the surfacing constantly and minutely during progress.

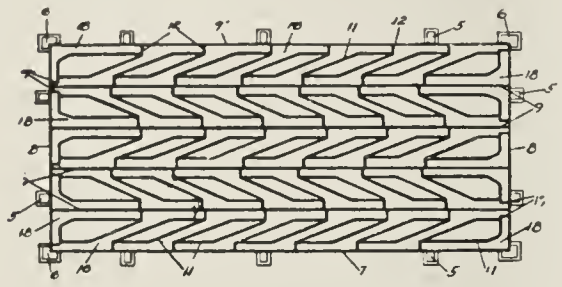
"8. Wherever possible, the surfacing

(Continued on page 50)

Interesting Cement Patents

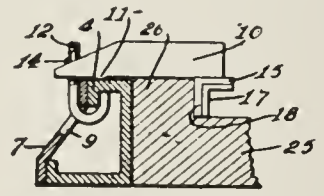
Recent Patents of interest to readers of Cement and Engineering News specially prepared for this publication by Clarence A. O'Brien, Registered Patent Attorney, Room 69 Southern Building, Washington, D. C.

1,459,945. MOLD FOR CONCRETE BLOCKS. Emil C. Boniger, Davenport, Iowa. Serial No. 453,855. 2 Claims. (Cl. 25—121.)



1. A device of the class described, comprising a frame; and a series of substantially diamond-shaped forms arranged in said frame in spaced-apart overlapping relation, and provided at their ends with oppositely disposed extensions adapted for engagement with said frame.

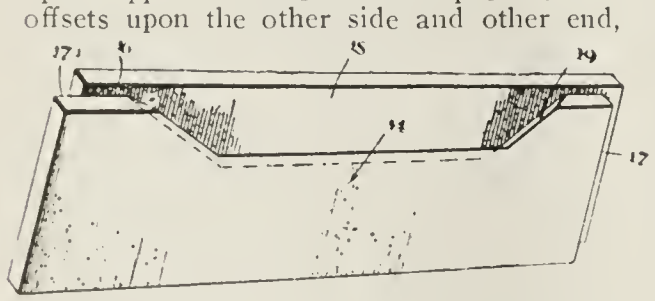
1,459,207. CONCRETE FORM. John N. Heltzel, Warren, Ohio. Serial No. 546,387. 4 Claims. (Cl. 25—118.)



1. In a device of the class described, a side rail; a support fulcrumed intermediate its ends on the side rail for vertical swinging adjustment and extended transversely of the rail; a curb former carried by the outer end of the support; and a connecting member engaging the inner end of the support and the rail, the concecting member comprising relatively adjustable parts constituting means for imparting vertical swinging adjustment to the support and the curb former.

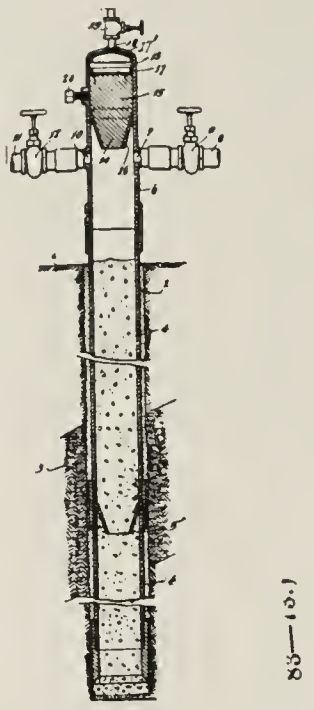
1,459,684. FACING FOR CEMENT WALLS. Fred A. Northwall, Portland, Ore. Serial No. 563,759. 1 Claim. (Cl. 72—21.)

A facing element of the character described, comprising a plate-like formation having offsets in its faces along each end thereof and each side thereof, the offsets upon one side and upon one end occurring upon opposite faces with respect to the offsets upon the other side and other end,



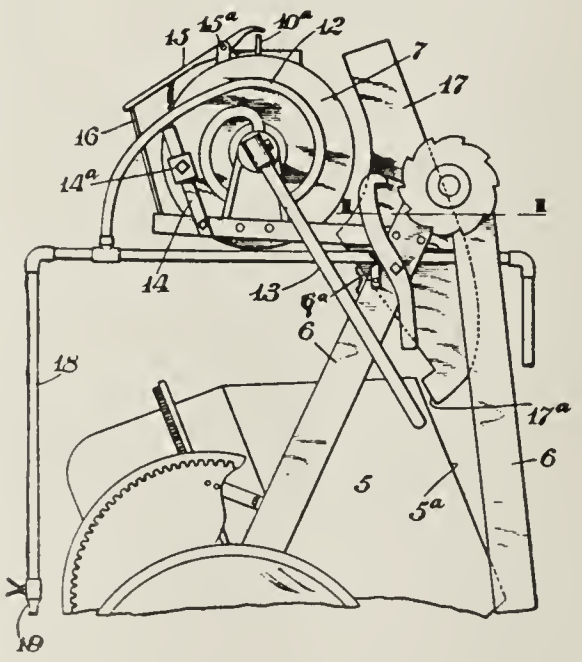
respectively, and one face having its offset occurring along its upper longitudinal edge extended inwardly intermediate the ends thereof and walls forming the termination of the offset comprising two divergent end walls and an intermediate or conecting wall, and each of said walls sloping inwardly for the purpose described.

1,459,345. WELL-CEMENTING APPARATUS. William J. Robertson and Harry E. Becker, Fullerton, Calif. Serial No. 575,785. 5 Claims. (Cl. 166—1.)



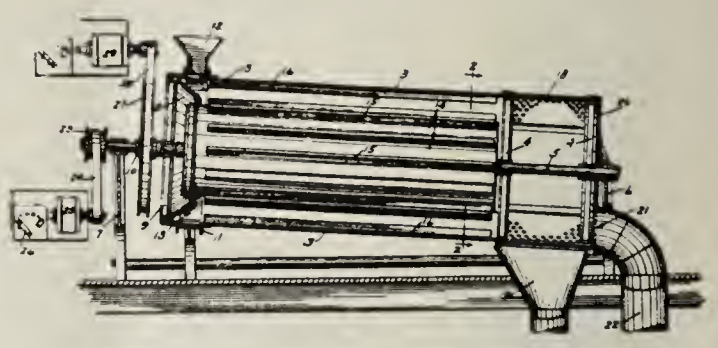
1. A well-cementing apparatus comprising a casing through which cement may be forced into a well-bore, means for injecting cement into the casing, a plunger element slidable within the casing above the cement, means creating a pressure within the casing above the plunger to move the plunger downwardly and force the cement from the lower end of the casing, and a stationary abutment carried by the casing and functioning to positively arrest the plunger at a fixed distance from the lower end of the casing.

1,458,707. WATER TANK FOR CONCRETE-MIXING MACHINES. Gebhard Jaeger, Columbus, Ohio. Serial No. 514,949. 6 Claims. (Cl. 83—73.)



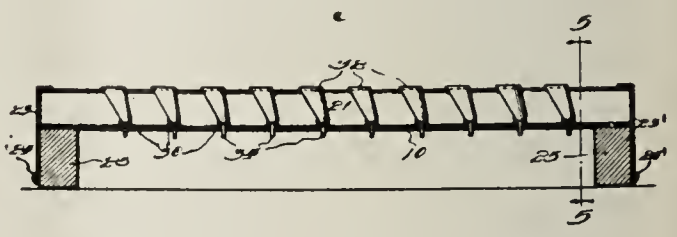
1. The combination with a mixing drum, of means for supplying water thereto including a tank, means for swinging the same to discharging and charging position and means carried by the tank for automatically supplying and controlling the supply of water to said tank in the charging position.

1,458,387. PROCESS OF TREATING CONCRETE AGGREGATE. Charles Luther Bourne, Minneapolis, Minn. Serial No. 381,925. 2 Claims. (Cl. 83—11.)



1. The process of treating aggregate material comprising gravel or other rock particles associated with softer particles, such as soft rock, shale, clay, dirt and the like, which consists in subjecting said material to repeated impacts between relatively moving surfaces, regulating such impacts in number and force so as to break up particles having a coefficient of hardness less than a certain standard but not to break up the particles having a coefficient of hardness greater than said standard, and then separating the broken-up particles from the unbroken particles to produce an aggregate material having a standard of hardness suitable for concrete.

1,460,232. CONCRETE MOLD. General M. Ditto, Joliet, Ill. Serial No. 548,328. 7 Claims. (Cl. 25—121.)



7. In a mold for plastic materials, the combination of a body comprising a floor provided with a depressed portion along one edge, said floor terminating in upstanding side walls, molding bars removably secured to each side of the side walls, one of said molding bars being suspended to overlie the depressed floor portion, gates for the opposite ends of the body, a plurality of socket members secured in parallel relation to the floor of the body and in transverse relation to the side walls, each socket member being accurately channeled along its upper edge, a plurality of downwardly converging wedge shaped core pieces, each having its lower edge rounded to fit removably within the associated socket, and a dowel pin for each core piece and socket for removably holding the core piece within the socket, substantially as described.

F. C. Price and C. W. Coburn, both of San Francisco, Cal., and C. J. Waterhouse and R. M. Lyman, of Oakland, Cal., have incorporated the Pacific Lime & plaster Company, of Sonora, Cal., for $100,000. The principal office will be located in San Francisco.

The Ehrenberger Gravel Company, of Schuyler, Neb., has recently purchased and intends to put into operation a sand and gravel pit just east of Schuyler. After the machinery has been installed the plant will be capable of loading fifty cars of sand and gravel daily.

Association Changes

Five rather important changes and appointments in the personnel of the Portland Cement Association were noted in its announcements of July 16th. The most important promotion is that of Walter B. Elcock, formerly division engineer and later manager of the Atlanta office, to assistant general manager of the southeastern offices. The changes follow in detail:

P. H. Johnston as district engineer in charge of the new association offices recently opened in the Graham Building, Jacksonville. This office will have charge of the association activities in the state of Florida.

Since joining the association staff more than two years ago, Mr. Johnston has been attached to the Atlanta office, first as field engineer in North Carolina and recently as field engineer in Florida.

James A. Hudson as district engineer in charge of the new association office just opened in the Exchange Building in Memphis. This office will have charge of the association activities in Tennessee.

For several years prior to joining the association staff in July, 1919, Mr. Hudson was engaged in various engineering and construction works with one of the southern cement companies and later with the War Industries Board. He has been connected with the Atlanta office of the association as the field representative in Mississippi.

J. R. Fairman as district engineer in charge of the new association office just opened in the Jefferson County Bank Building at Birmingham. This office will have charge of the association activities in Alabama.

Mr. Fairman is an engineering graduate of the University of Missouri and prior to joining the association staff was engaged in various structural and highway engineering capacities. For eighteen months during the period 1917 to 1919 he was a Major of Engineers in the overseas service of the United States Army. Since entering the employ of the association nearly three years ago he has been the association field representative in Kansas and Missouri.

Walter B. Elcock is assistant general manager in charge of the southeastern offices of the Portland Cement Association. Mr. Elcock joined the staff of the Portland Cement Association in April, 1914. During 1915 he was division engineer in charge of association work in Colorado, Utah, Wyoming and Idaho. In 1916 he was appointed manager in charge of our Atlanta office. He has been continuously with the association since joining our staff, excepting for two years spent in the army during the war as major of infantry. His headquarters will be as heretofore at the Portland Cement Association office in the Hurt Building, Atlanta.

J. M. Marshall is district engineer of the association office at Atlanta, Ga. Mr. Marshall, who succeeds Walter B. Elcock, recently promoted to assistant general manager in charge of southeastern offices of the association, will have charge of association work in Georgia, North Carolina and South Carolina. He is a graduate of the civil engineering department of the Virginia Military Institute, Lexington, Va. From 1905 to 1917 he was engaged in various engineering work for the Seaboard Air Line and Pennsylvania railroads, the Rapid Transit Subway Construction Co., New York, and the U. S. War Department. In May, 1917, he was commissioned first lieutenant of engineers and spent eighteen months in France with the Eleventh Engineers, returning to the United States as captain in the spring of 1919. He immediately entered the employ of the Portland Cement Association as field engineer, attached to the New York office, on special work in Rhode Island and eastern Massachusetts. Lately he has been assistant to the association's district engineer in New York.

Portland Cement Output in June

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for June, 1923, were made necessary by the lack of returns from three producers.

Production, shipments and stocks of finished portland cement by districts in June, 1922 and 1923, and stocks in May, 1923, in barrels

Commercial District	Production June		Shipments June		Stocks at End of June		Stocks at End of May
	1922	1923	1922	1923	1922a	1923	1923a
Eastern Pa., N. J. and Md.	2,827,000	3,155,000	3,219,000	3,415,000	3,165,000	3,082,000	3,342,000
New York	539,000	648,000	584,000	676,000	825,000	730,000	759,000
Ohio, Western Pa. and W. Va.	1,092,000	1,263,000	1,335,000	1,359,000	1,126,000	915,000	1,011,000
Michigan	717,000	747,000	903,000	863,000	586,000	433,000	549,000
Ill., Ind. and Ky.	1,851,000	1,867,000	2,571,000	2,093,000	1,639,000	529,000	755,000
Va., Tenn., Ala. and Ga.	544,000	647,000	609,000	663,000	334,000	192,000	208,000
Eastern Mo., Ia. and Minn.	1,238,000	1,224,000	1,701,000	1,447,000	1,238,000	1,299,000	1,522,000
Western Mo., Neb., Kan. and Okla.	806,000	866,000	862,000	768,000	798,000	1,027,000	929,000
Texas	275,000	334,000	330,000	368,000	236,000	201,000	235,000
Colo. and Utah.	243,000	276,000	230,000	276,000	177,000	178,000	178,000
California	762,000	1,021,000	746,000	1,000,000	275,000	157,000	136,000
Ore., Wash. and Mont.	351,000	334,000	380,000	379,000	319,000	476,000	520,000
	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	9,219,000	10,144,000

a—Revised

Stocks of clinker, or unground cement, at the mills at the end of June, 1923, amounted to about 4,154,000 barrels compared with 4,470,000 barrels (revised) at the beginning of the month.

Production, shipments and stocks of finished portland cement by months in 1922 and 1923 in barrels

Month.	Production		Shipments		Stocks at End of Month	
	1922	1923	1922	1923	1922a	1923
January	a4,291,000	7,704,000	a2,931,000	5,419,000	13,316,000	a11,470,000
February	4,278,000	8,085,000	3,285,999	5,963,000	14,142,000	a13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	13,484,000	a13,045,000
First quarter	15,254,000	25,669,000	13,218,000	21,708,000	.....	.....
April	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	a11,463,000
May	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	a10,144,000
June	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	9,219,000
Second quarter	31,664,000	36,651,000	34,811,000	40,518,000	.....	.....

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in May, 1923, amounted to 88,480 barrels, valued at $162,877. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in May were, from Quebec and Ontario Provinces, Canada, 35,304 barrels; Norway, 29,948 barrels; Belgium, 12,415 barrels; Germany, 6,952 barrels; Sweden, 2,526 barrels; other countries, 1,335 barrels. The imports were received in the following districts: Florida, 23,192 barrels; Vermont, 13,154 barrels; Georgia, 12,403 barrels; New Orleans, 12,350 barrels; St. Lawrence, 10,527 barrels; Buffalo, 8,871 barrels; Los Angeles, 2,526 barrels; Rochester, 2,109 barrels; other districts, 3,348 barrels.

a—Revised.

The exports of hydraulic cement in May, 1923, were 103,634 barrels, valued at $355,299, of which was sent to Cuba, 43,873 barrels; to the other West Indies, 4,731 barrels; South America, 37,226 barrels; Mexico, 7,821 barrels; Central America, 5,370 barrels; Canada, 1,634 barrels; and to other countries, 2,979 barrels. The total exports of hydraulic cement in 1922 were 1,127,845 barrels, valued at $3,206,201.

The statistics of imports and exports of hydraulic cement in June, 1923, are not available.

Imports and Exports of hydraulic cement, by months, in 1922 and 1923, in barrels

Month.	Imports		Exports	
	1922	1923	1922	1923
January	17,039	17,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	(b)	96,263	(b)
July	957	.....	119,491	.....
August	56,757	.....	105,156	.....
September	c42,641	.....	78,615	.....
October	d65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823	.....	1,127,845	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce. (b) Imports and exports in June, 1923, not available. (c) Covers period September 1-21, Imports September 22-30 included with October. (d) Includes imports period September 22-30.

The Central States Engineering Company announces the removal of its offices from the sixteenth to the eighth floor of No. 28 E. Jackson boulevard, Chicago. Increasing business required larger and better facilities for this company which specializes in the design of cement plants.

News of the Cement Mills

The Midway Lime & Cement Company, of Culver City, Cal., has recently been incorporated with a capital of $50,000.

The Newaygo Portland Cement Company, of Newaygo, Mich., is going to spend $350,000 for new machinery for its plant.

Federal Department of Labor reports show that the cement industry is one of the five in the country now working full time.

James Lawrence recently purchased the Blake Stone Quarry at Golden, Colo. He will put in a stone crushing plant at the property.

More than a million dollars will be spent for equipment to enlarge the Sun Portland Cement Company's Boise, Idaho, plant to a 1,200-barrel capacity.

C. M. Croft, B. F. Peabody and O. L. Allen recently incorporated the Bankers' Portland Cement Company, Charlestown, W. Va., for $5,000,000.

The property of the Western States Portland Cement Company at Independence, Kan., has been acquired by the Atlas Portland Cement Company.

Not a single bid was received for recent proposed highway construction in Chicago. Contractors blamed the shortage of cement for their failure to bid on the work.

Minnesota, according to the *St. Paul News,* has also appointed a committee to investigate the feasibility and advisability of establishing a state-owned cement plant.

According to the San Bernardino, Cal., *Sun,* the output of the Riverside Portland Cement Company's Oro Grande plant has been doubled within the past few months.

The Trinity Portland Cement Company has announced the purchase of 602 acres of land northwest of Fort Worth, Tex. Work on the new 2,500-barrel plant will begin immediately. W. H. L. McCourie is president of the organization.

After having bought about 120 acres of land three miles west of Rapid City, S. D., the Globe Portland Cement Company, of Minneapolis, Minn., is ready to erect a new 2,000-barrel plant. H. H. Hindshaw is chief engineer for the company.

The Arrowhead Portland Cement Company is spending $2,000,000 on a new mill at Cajon Pass., Cal. The plant, using the wet mix process, will produce about a million barrels of cement a year, according to W. H. E. Bravender, president of the company. The main offices are to be located in Los Angeles.

C. O. Soderquist, general superintendent of the Buffington, Ind., plant of the Universal Portland Cement Company, died on July 20th. Mr. Soderquist, who was only forty-one years of age, started in the plant in 1904 as machinist, and rose step by step through the plant to the position he held at the time of his death.

The Monolith Portland Cement Company, of Monolith, Cal., announces through H. E. Ish, district freight and passenger agent of the Southern Pacific Railway, that during the next fiscal year the capacity of its plant, now from 1,800 to 2,000 barrels daily, will be increased to 6,000 barrels each day.

The U. S. Gypsum Company, of Chicago, will build a million dollar mill at Sweetwater, Tenn., for the manufacture of plaster of paris, cement and other gypsum products. A large gypsum deposit has been purchased and work has been started on the building of a railroad from the mill to the supply of raw material.

Work has already started on the construction of a railroad to run between Lemon Grove and Three Rivers, Cal., where the San Joaquin Portland Cement Company of Fresno owns what is known as the world's largest cement deposit, that of Marble Mountain. Construction of the plant will begin shortly. John F. Hamburg, formerly vice-president and general manager of Hackeld & Co., Honolulu importers and shippers, is heading the cement company.

Because of the immense unprecedented building program of Los Angeles, Cal., including the construction of a $12,000,000 outfall sewer and 180 miles of concrete sidewalks, coupled with the apparent inability of local cement manufacturers to cope with the increased demands, the Los Angeles *Express* reports that Danish and German bids have been invited to supply the 120,000 barrels of cement required at the present time. A Danish steamer, loaded with 3,000 tons of cement, recently filled the first consignment of the order.

Work has already been started in opening the cement quarry for the Yosemite Portland Cement Company, sixty-eight miles from Merced, Cal., and the construction of the mill at that point will be started shortly. The plant, which will cost about a million and a half dollars, will have a daily output of 2,000 barrels. George E. Nicholson, of Kansas City, Mo., is president of the company; C. S. Woody, of San Francisco, Cal., is vice-president, and E. DeLos Magee, also of San Francisco, is secretary.

The Missouri state highway commission recently took steps to secure cheaper cement for the state's sixty million dollar road program when it announced that bids would be asked on the erection of a plant or plants to manufacture the material needed in the construction of roads. Under the plan proposed the state would furnish all or part of the funds, the bidder to operate the plant, agreeing to buy it from the state when the road construction is completed. The commission explained, in making the announcement, that the state is not attempting to fight the cement manufacturers, but that it believes that it should be entitled to buy cement at wholesale rates for the big building program.

Road Congress

(Continued from page 47)

should be executed for its full width at a single operation.

"9. If the surfacing is in two layers the second layer must be placed in position before the setting of the first is complete and both layers rammed at one time.

"10. As regards the advisability of using mechanical plant, the question of economy should be considered in each case. It is, however, very important for the strength of the concrete to employ an appropriate and well regulated quantity of water. It is advisable that the leveling, the tamping and the finishing be undertaken mechanically whenever this is possible. Moreover, to insure a homogeneous mixture, it is well to utilize concrete mixers supplied with devices for regulating the quantity of water and duration of preparation. The requisite proportion of water should form the subject of methodical study.

"11. It does not appear advisable at present to express an opinion as to whether reinforced concrete should be employed in preference to mass concrete and in what circumstances. Studies and experiments should be continued upon this very interesting problem.

"12. Researches should be continued as to the means to be adopted for reducing to a minimum the formation of cracks. The utility of providing expansion joints when the concrete is exposed to wide variations of temperature and humidity, must be studied in each case. Every such joint, in effect, constitutes a source of weakness in surfacing, and may prove the starting point of grave deterioration.

"13. In order to avoid accidents occurring to concrete roads as the result of expansion caused by variations of temperature and humidity, the introduction of expansion joints may be considered at distances to be determined in each particular case. The nature of the jointing materials and precautions to be adopted; both for this type of joint as well as for joints where work terminates, should continue to form the subject of experiments.

"14. All tests and experiments undertaken with a view to effecting economies in this type of surfacing when carrying traffic consisting of light and medium vehicles are of considerable interest. Apart from concrete roadways strictly so called, interesting results have already followed the adoption of a resurfacing method, whereby a matrix of sand and hydraulic lime is added to the macadm during or subsequent to the laying. Investigations along these lines should be pursued."

Building Conditions

The July issue of the *Federal Reserve Bulletin* contains the following comment on building conditions: Actual construction operations continue to be maintained at a record rate, although the permit statistics indicate that there has been a moderate curtailment in the plans for new buildings. Building material prices registered a decline of over 1 per cent in April, following a steady upward movement since March, 1922. Production of building materials, however, continues to be very large and manufacturers' stocks are considerably lower than a year ago.

"During May contract awards in 10 Federal reserve districts (compiled from statistics gathered by the F. W. Dodge Co.) reached a total value of $426,804,000, which was 7 per cent greater than in April. Increases were recorded in all reporting districts except New York, Philadelphia, and Chicago. The expansion in new operations was particularly pronounced in southern sections, amounting to 81 per cent in the Atlanta district, 25 per cent in the St. Louis district, and 11 per cent in the Richmond district. May contracts for seven reporting districts were 6 per cent larger than a year ago. Contracts for residential buildings were 2 per cent less in May than in April, due to a substantial curtailment in the New York district. The number and value of building permits issued in May decreased in 168 reporting centers by 1 per cent and 18 per cent, respectively.

News of the Concrete Products Factories

Joseph Supple, Portland, Ore., is erecting an $8,000 concrete products plant.

The Tile Inlaid Roofing Company, of Buffalo, N. Y., has recently increased its capitalization to $10,000.

The Detroit Cast Stone Company, No. 8506 South Street, Detroit, Mich., has increased its capital from $50,000 to $100,000.

Concrete block, tile, etc., will be manufactured by the Concrete Units, Ltd., Toronto, Ont., recently incorporated for $40,000.

E. E. Bruhn, G. Herff, and E. A. Lueck, of Milwaukee, Wis., have incorporated the San Tile Company for $100,000.

The Florida New-Tex Brick Company, of Tampa, Fla., is now building a branch plant in Miami for the manufacture of concrete brick.

J. J. Collins, G. C. Motley, and J. B. Finnigan have incorporated the Cast Stone Products Company, of Portland, Ore., for $10,000.

The Prokest Concrete Company, No. 610 Title Insurance Building, Los Angeles, Calif, has recently been incorporated with a capital of $80,000.

E. M. Galli, Hollister, Calif., and Joseph Cassi, now operating a concrete pipe plant, have acquired property for the erection of a branch factory.

The Bradbyer Dunntile Manufacturing Company, of Tulsa, Okla., is constructing a plant for the manufacture of building tile, drain, silo, and roofing tile.

The Spickelmier Fuel & Supply Company will manufacture concrete building tile and other products, according to C. V. Spickelmier, general manager.

The Cast Stone Products Company, of Baltimore, Md., is erecting a new plant for the manufacture of hollow tile, blocks, and other concrete specialties.

The National Concrete Block Corporation, of Delaware, of which J. W. Magee, of Pittsburgh, Pa., is president, in contemplating the manufacture of building wall tile.

The Indiana Concrete Products Company, of Indianapolis, Ind., has recently been incorporated with a capital of $10,000 by Charles E. Phillips, Joseph Erpelding and Lawrence Erpelding.

The Dixie Portland Cement Company, Hill and River streets, Chattanooga, Tenn., will start the manufacture of concrete roofing and hollow tile soon, with a capacity of about 2,000 tile per day.

Howard L. Sampson, of Whitman, Mass., and W. S. Barlow and A. W. Barlow, of Brockton, have incorporated the Cement Building Products Company, of Brockton, Mass., with a capital of $25,000.

The International Concrete Industries Corporation is the new name of the International Concrete Corporation. The capital of the organization has been increased from $1,000,000 to $1,050,000.

Having secured a large deposit of raw material about eight miles from Reno, the Nevada Magnesite Products Company, of Reno, Nevada, has organized and is planning the construction of a plant for the production of artificial stone products, including tiles, blocks, and other materials, using magnesite under a special process. Charles H. McCarthy is president of the company and Paul Butler is vice-president.

Tile blocks and other products will be manufactured by the Cement Products Manufacturing Company, of Roanoke, Va. Ground will soon be broken for the new plant.

The Interlocking Tile and Sewer Pipe Company, of Ontario, Calif., controlled by J. F. Gale and D. E. Bulger, is planning on erecting a plant to cost about $75,000 near Indio, Calif.

The Wolf River Sand Company, No. 4 Turit Street, Memphis, Tenn., now operating a pit with a daily capacity of 500 yerds, is contemplating the manufacture of concrete products, such as tile, brick and blocks.

E. Lyon, C. Schmidt, and H. D. Duncan, all of Springfield, Ill., have incorporated the Lyon Stucco Company, capitalized at $15,000, for the compounding and manufacture of magnesite products, stucco, flooring materials, and other products.

Louis A. Spellshouse, Albert A. Blakeney, and R. G. Harrison have incorporated the Concrete Garage Mold Corporation for $200,000 at Baltimore, Md. The new concern will manufacture knock-down molds, frames, and other things used in the erection of garages.

The Stillwell Sand & Gravel Company, of Anderson, Ind., has purchased property at the east edge of Anderson and begun the organization of a corporation which will manufacture concrete products on a large scale. The company will produce concrete tile, roofing, blocks, brick and other products.

The newest plant of The Worrall Brothers Company, Louisville, Ky., is equipped to turn out 3,600 blocks per day, and has yardage space to accommodate more than 100,000 blocks. Electric power is used exclusively in the operation of the plant. It is owned by R. R. Worrall and M. M. Worrall.

A. H. Mankedick, of Sullivan, Ind., has resigned his position with the Wilkinson Lumber Company to give his attention to the manufacture of concrete blocks. He has formed the Colonial Concrete & Supply Company, with headquarters in the Planing Mill Building, and will go into the manufacturing business on a large scale.

The Century Cement Products Company, Lyndhurst, N. J., specializing in the manufacture of blocks, tile, and kindred products under a special process, is planning material enlargements to its plant. The president, J. H. McGuire, is mayor of Passaic, N. J. David Slayback is vice president and treasurer.

The impermeable concrete for lining reservoirs, produced by the Queensland railways, contains half as much steel dust as cement, the proportion of sand being reduced. The product is stated to have increased hardness and resistance as well as greater impermeability, and to be less affected than ordinary concrete by the chemical action of fresh or sea water.

Cement is being placed over the facade of the ancient Temple of Quetzalcoatl at the ruins of San Juan Teotihuacan, in the Valley of Mexico, according to a report published by the Mexican ministry of agriculture. Torrential rains have endangered the existence of the prehistoric ruins, according to the report, and measures were necessary to prevent the weakening of the ruins by standing water in pools and by seepage.

Tests are now being conducted by the El Paso (Tex.) Electric Railway Company to determine whether or not concrete bridges can supplant wooden structures in the crossings of the Rio Grande. According to the engineers of the company, bed rock has never been reached, so that the sinking of a concrete bridge, due to its weight, might make its use impossible in taking care of the heavy traffic over the river.

New Publications

The Concrete Block Machine Company of No. 111 Hampton Street, Newark, N. J., is issuing a well illustrated and beautifully printed broadcast showing the lock block machine manufactured by the company.

Wharton Clay, the commissioner of the Associated Metal Lath Manufacturers, No. 123 W. Madison Street, Chicago, has issued specifications for metal lath construction. For years the various manufacturers of metal lath have given out slightly conflicting recommendations on the use of their products. It has been very difficult for the companies to arrive at a uniform recommendation, because they are manufacturing some seventy-three different kinds, weights, gauges and qualities of metal lath. These specifications have reduced this great number to ten different weights, simplifying the sale, distribution and the specifying of metal lath. A copy of these specifications may be had by addressing Mr. Clay.

The Ingersoll-Rand Company, No. 11 Broadway, New York, has just issued a new thirty-seven page bulletin describing its "Imperial" Type XPV steam driven air compressors. This compressor is built in a number of different types and sizes. Standard two-stage machines for 100 pounds discharge pressure, range from 246 to 4,150 cubic feet per minute piston displacement. Single-stage compressors are built for furnishing air up to fifty pounds discharge pressure. In its bulletin the manufacture calls particular attention to the steam valve gear which is used on these compressors. This consists of completely balanced piston valves with riding cutoff valves which telescope within the main valves. Such valve gear will operate under any commercial steam pressure or degree of superheat and has proven to be very satisfactory on low or high-speed steam driven compressors. It can be easily understood that such a valve gear will also operate with excellent economy when used with ordinary saturated steam.

The Pennsylvania Pump & Compressor Company, of Easton, Pa., has just issued a thirty-two page booklet describing its line of air compressors and vacuum pumps, both power and steam driven. The bulletin is well illustrated and describes in an interesting manner the distinctive features of the company's products. In addition, several valuable and interesting tables regarding air compressor dimensions and performance have been included. The company has also recently compiled an instruction sheet for its intake regulators.

Quarry, Sand and Gravel Items

The National Gypsum Products Company, Pacific Mutual Building, Los Angeles, Cal., has incorporated for $750,000.

The Apex Crusher Rock & Sand Company, W. H. Light, president, of Los Angeles, Cal., has been incorporated for $225,000.

The Service Rock Company, 1102 Bank of Italy Building, Los Angeles, Cal., was recently incorporated with a capitalization of $500,000.

N. G. Wallace, Frank Semour and Frank Hutchinson have purchased the Collister gravel pit, of Terre Haute, Ind., from William Collister.

The Temple Silica Sand Company, Harrisburg, Pa., has recently been incorporated by Wellington B. Hunter, C. N. Hunter and W. M. Bertolet.

A. W. Kingsbury, O. F. Wadsworth and others have incorporated the Gold-Black Sand Mining Company, of Great Falls, Mont, for $50,000.

M. E. Graves, Ross Lucas and Frank Billings, of Morocco, Ind., have incorporated the Morocco Sand & Gravel Company, with a capital of $25,000.

The R. C Belk Sand Company, of Mount Holly, N. C., operating a fifty-car plant, is planning on taking on some new equipment in the near future.

The West Coast Rock & Gravel Company, J. B. Haas, president, doing business in San Francisco, Cal., has recently been incorporated for $150,000.

The Greenlawn Gravel Company, of Columbus, O., was recently incorporated for $50,000 by H. H. Gill, Harry Leyton, C. O. Rhoades and L. J. Paulson.

M. M. Bolyard, Newburg, W. Va., and J. W. Shaffer and L. E. Bolyard, both of Tunnelton, W. Va., recently incorporated the Northwest Pike Lime Company of Tunnelton.

The Marion County Lime Company, Ocala, Fla., was recently incorporated for $100,000. E. F. Fitch is president of the company, while Jack Camp is secretary and treasurer.

The Waldo Country Agricultural Lime Company, Lincolnville, Me., has recently been incorporated with a capital of $10,000. O. W. Ripley is president, A. S. Hall, treasurer, and A. H. Miller, clerk.

Kenneth Dickerson and F. A. Braman, of Riverside, Calif., have opened up a gravel screening plant which they expect will have a daily capacity of about 100 yards. They expect to increase this output later.

The Dixon Gravel & Sand Company, Dixon National Bank Building, Dixon, Ill., now operating a plant with a daily capacity of 300 cubic yards, is planning on increasing its capacity materially within the next six months.

The American Sand Company, of Turner, Kans., has recently been incorporated with a capital of $100,000 by H. B. Thompson, R. B. O'Brien and L. W. O'Brien. The capacity of the plant is from five to ten cars daily.

The Wolf River Sand Company, No. 4 North Turit Street, Memphis, Tenn., now operating a pit with a daily capacity of 500 yards, is building, under the name of the Bond Sand & Gravel Company, a new plant at Madison, Ark.

Forty tons daily is the present goal of the Atlas Rock Company, of Oakdale, Calif., which recently incorporated for $150,000 and laid plans for doubling its capacity. A. C. McMillan, of Fresno, Calif., is president of the company.

About $500,000 will be spent by the O'Neal Lime Works, Inc., of Birmingham, on its new plant at Calera, Ala. The new installations will include ten new kilns, each with a daily capacity of forty tons, a power house, machine house and a crushing and quarry plant. J. H. Adams is president of the concern.

The Blue Ridge Stone Corporation, the Pounding Mill Quarry Corporation, and the Pembroke Limestone Corporation, all of Roanoke, Va., have recently been merged into one company with a combined capitalization of $1,100,000. The new company now contemplates the installation of electric power equipment, quarry machinery, and grinding and crushing equipment. J. P. Woods is president.

Federal Aid System

(Continued from page 42)

of the Lowman-Stanley, road running east from Lowman for six miles, were readjusted so that $10,000 will come from the forest highway fund, $43,000 from the forest road construction fund, and $47,000 from the forest development fund, making a total of $100,000 for this project.

The Strawberry-Sharon project within the Cache National Forest is to receive $15,000 from the forest highway fund and $5,000 from local authority. This road extends from Sharon to the main road near the west boundary of the forest, a distance of fifteen miles.

For seven miles of the Ketchum-Clayton road the sum of $55,000 from the forest highway fund was approved, and for removing slides in the Tamarack section of the North and South Highway the sum of $2,500 was approved.

For the maintenance of forty-four miles heretofore constructed the sum of $9,400 was approved, and for location surveys covering twenty-five miles the sum of $10,000 was set aside.

Expenditures totaling $146,000 of forest highway funds for road-building work in Wyoming have been approved by Secretary Wallace.

Six projects are included in the program approved, one of which calls for the extension of the Aladdin-Hulett road in the western part of the Black Hills National Forest. The sum of $20,000 was approved for this extension, which is to be one mile in length.

To assist on constructing approximately four miles along the Cody-Yellowstone highway the sum of $30,000 was set aside, bringing the total allotment for the Cody-Yellowstone project up to $85,000. This road is of importance to the Shoshone National Forest.

The sum of $28,000 was approved for construction work along the Cheney-Summit section of the Hoback Canyon road in the Teton National Forest. An additional $19,900 for this project will be appropriated from the federal forest road construction fund. It is also planned to reconstruct that section of the Hoback Canyon road that runs between Cheney and Jackson, a distance of six miles, the sum of $40,000 being approved for this work.

For the construction of six miles along the Wind River road within the Teton National Forest the sum of $25,000 was approved. The project in question runs six miles west of Buffalo Bridge and forms a link in the main highway leading to the south entrance of the Yellowstone National Park.

Location surveys of ten miles of highway in the Teton Forest will be undertaken, for which work the sum of $3,000 was approved.

Concrete Road Slabs

WASHINGTON, July 28. — Thirty-three thousand trips have been made around the circular concrete track in the wear test being conducted by the Bureau of Public Roads of the Department of Agriculture and the first evidences of wear are just becoming noticeable.

On account of the manner in which the traffic apparatus is constructed 33,000 trips is equivalent to the passage of 66,000 trucks, equipped with solid tires and so loaded that the weight per inch width of tire is 600 pounds. The truck is constructed of a number of different kinds of concrete and at the present stage of the test the wear is so slight that comparisons cannot be made between them.

In the traffic test being conducted to determine the cause of waving or corrugations in bituminous surfaces 30,000 trips have been made by a five-ton truck loaded to capacity and slight displacements are becoming noticeable in some of the sections. Careful measurements with special apparatus are being made on all sections and at the end of the experiment there will be a complete history of the development of all imperfections.

Wholesale Prices Compared

WASHINGTON, July 28.—Comparisons in sand for June and preceding months are given in the following tabulation of the Bureau of Labor Statistics of the Department of labor:

Commodity	Average prices			Index numbers (1913=100)		
	May, 1920.	May, 1923.	June, 1923.	May, 1920.	May, 1923.	June, 1923.
Cement, Portland, per barrel, f. o. b. plant—						
Simple average of 6 plant prices in Pa., Ind., Minn., Tex., and Calif.	1.994	1.892	$1.892	191.9	182.0	182.0
Buffington, Ind.	1.742	1.750	1.750	172.3	173.1	173.1
Gravel, per ton, f. o. b. pit, average of 27 plant prices	1.091	.951	.958	220.6	192.3	193.9
Sand, building, per ton, f. o. b. pit, average of 31 plant prices	.759	.628	.622	199.3	164.9	163.3

Cement and Engineering News

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How Big Is Your Coal Pile?

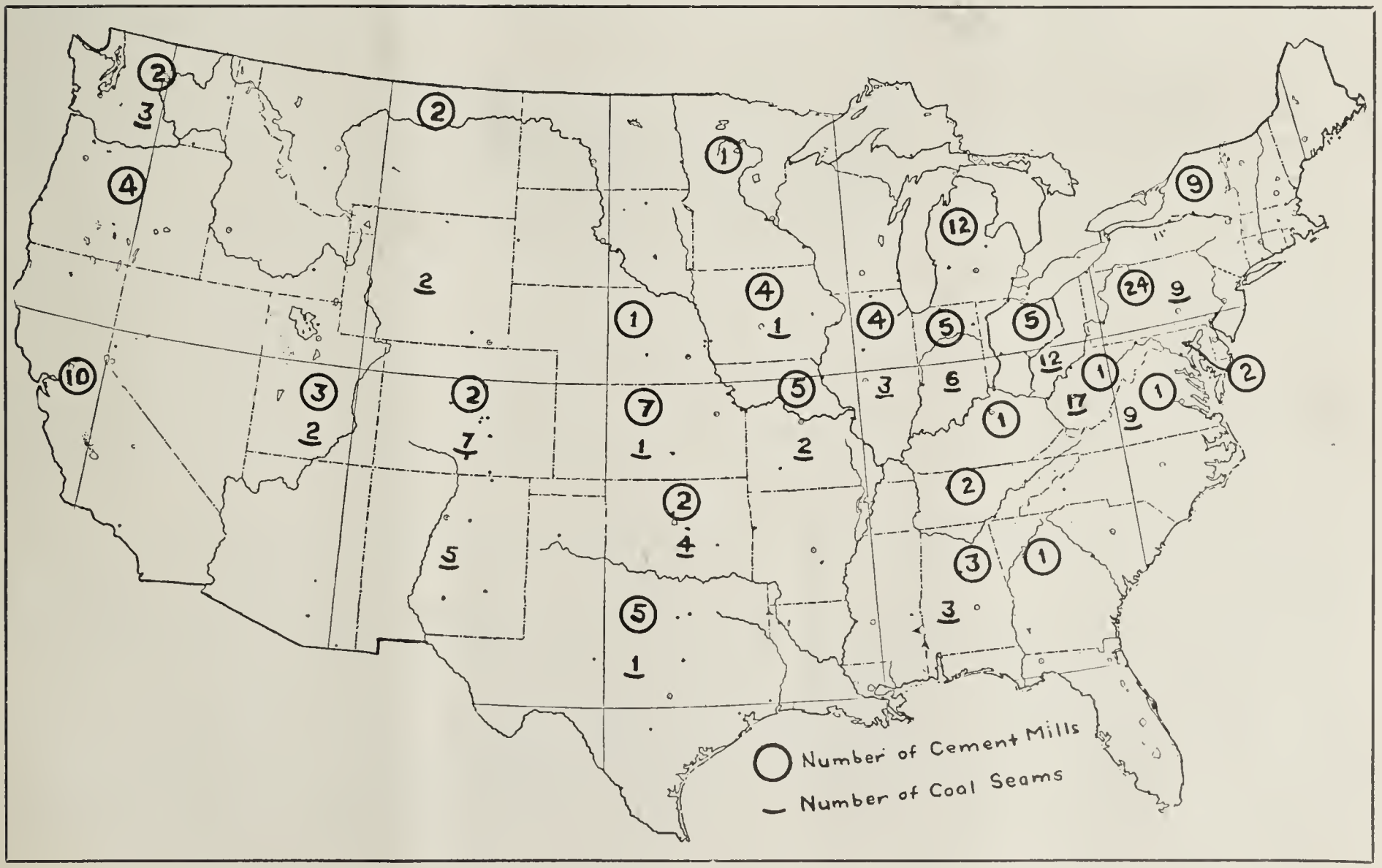
Possible Effect of Threatened Anthracite Strike on the Cement Industry—Other Factors Which Indicate Wisdom of Early Storage

At no time, perhaps, in the past has the matter of coal supply been of such great interest in all lines of industry as it is at present. Every consumer of coal is wondering what the future will bring forth—whether or not coal supply in sufficient quantity and of proper quality will be available—whether or not costs are going to vary to an extent that will vitally affect manufacturing costs. This interest has been brought about by threats of a strike in the anthracite fields. Such a strike, if it did take place, would affect the production of anthracite only. Its effect on bituminous coal would be to increase demand for certain grades for use as anthracite substitute, and by that increased demand to probably increase the price.

By the time these words are in type the matter of strike or no strike will be settled. There is a fair chance that there will be no strike. However, the subject is of sufficient interest to justify a serious discussion of the effect of an anthracite strike on the cement industry. This is particularly true since coal is a major item of expense in cement production. The volume of coal required in the manufacture of cement is so great that, for every dollar increase in the per ton cost of coal a similar increase of ten cents is registered in the production cost of each barrel of cement.

In the study of a potential shortage of coal it must be borne in mind that the potential production capacity of the United States is in excess of twice our requirements. We consume not to exceed 600,000,000 tons of coal, anthracite and bituminous. We can produce, with every mine in the country working full time, upwards of 1,300,000,000 tons per year. It is thus evident that the cessation of anthracite production which is only about 100,000,000 tons per year still leaves us with a possible production of twice our needs and can be serious only to consumers who have difficulty in burning anything other than hard coal.

The cessation of anthracite production—2,000,000 tons per week, would throw on the soft coal industry the burden of producing sufficient fuel to make up that deficiency. Considering the higher average efficiency which is obtained from hard coal it is liberal to as-



sume that 2,500,000 tons of bituminous will do that work. Now, when the bituminous mines are admittedly working at less than fifty per cent of capacity, they are averaging 11,000,000 tons per week output. A twenty-five per cent increase in their present output, or a net increase of 12½ per cent in potential capacity, will turn the trick, with the soft coal fields working at 62½ per cent of their ability to produce. This demonstrates an ample margin of safety for the nation as a whole.

It must be repeated here that a prolonged anthracite strike would cause suffering, but *only* to those who can with difficulty change from hard coal to soft coal consumption. With proper education in its use and with proper equipment in the hands of the user, it would be practicable to perform every function of our national life even if anthracite was permanently eliminated.

Nor is it sufficient to say that bituminous will have to supply the anthracite deficiency. The hard coal output is divided, about half and half, into domestic sizes and industrial or steam sizes. Of the potential 2,000,000 tons per week shortage, the 1,000,000 tons normally used in industry could and would be replaced by a slightly larger tonnage of almost any standard soft coal. The 1,000,000 tons per week which is consumed in domestic stoves, ranges and furnaces would have to be replaced by the better grades only of bituminous, as the poorer grades are not adapted for domestic use. Thus the burden of substitution for this domestic fuel would fall largely on certain districts, principally the better smokeless fields, and such other high grade fuels as those produced in southern Illinois, eastern Kentucky and similar areas producing coals which are high in heat units and low in ash and sulphur.

The Coal for Cement

Characteristics of coal ideal for cement burning are vitally different from that suitable for household use. A low ash content is not necessary in cement burning. This is for the reason that the burning is accomplished for the purpose of producing a clinker. The ash in the coal becomes a part of the clinker and, as ash is composed of practically the same elements as is cement, its presence produces no deleterious result. Similarly, a high sulphur content is not objectionable as its presence in no way reduces the quality of the resultant cement. Furthermore, domestic coals must be in sizes ranging from six inch lump down to about a two inch size, whereas cement is burned in rotary kilns with powdered coal for the making of which screenings or mine run are satisfactory. Increased demand for coal for domestic use will in no way directly compete with coal which is desired for cement manufacturing.

In general practice the requirements in coal forcement burning are that it be composed of approximately one-third (31 per cent or more) volatile matter and with a heat value of 12,000 or more British thermal units. Fortunately for the industry, coal which reaches this standard is produced in nearly every section of the country. The *Keystone Guide,* a standard reference work in the coal industry, lists producing regions of this class of fuel as follows: In Alabama, thirty-three different seams; in Colorado, seven different seams; in Illinois, three seams; in Indiana, six seams; in Iowa, various seams of minor importance and one major seam; Kansas, one seam; in Kentucky, more than twenty-six seams; in Michigan, several minor regions; in Missouri, two seams; in New Mexico, five seams; in Ohio, twelve seams; in Oklahoma, four seams; in Pennsylvania, nine seams; in Tennessee, eight; in Texas, one; in Utah, two; in Virginia, nine; in Washington, three in West Virginia, seventeen; and in Wyoming, two seams. In all, some twenty states with over 150 major seams scattered from the Atlantic to the Pacific.

Coal is of little or no use to the cement makers unless its point of production is at least reasonably close to the point of consumption, otherwise transportation costs so greatly enhance its cost as to render its use prohibitive. It is interesting to note the location of operating cement plants in the United States in relation to the above mentioned sources of coal supply. These plants are located in New York, nine; Pennsylvania, twenty-four; Maryland, two; Ohio, five; West Virginia, one; Virginia, one; Georgia, one; Alabama, three; Tennessee, two; Kentucky, one; Indiana, five; Illinois, four; Michigan, twelve; Minnesota, one; Iowa, four; Missouri, five; Nebraska, one; Kansas, seven; Oklahoma, two; Texas, five; Colorado, two; Montana, two; Utah, three; Oregon, four; Washington, two and California, ten.

The only states mentioned as producing coal suitable for cement burning which are not the home of one or more cement plants are New Mexico and Wyoming. The only states not producing such a coal which do produce cement are New York, Maryland, Minnesota, Nebraska, Montana, Oregon and California. As might be expected, in each of these seven states the cement plants are located either in close proximity to a coal field in an adjoining state or on a direct, low-tariff transportation route from such a state.

The Importance of Coal

Coal is of vast importance in the production of cement. Relatively speaking, cement is of minor importance to the coal producing industry. While the coal consumed in cement burning will probably approximate 10,000,000 tons this year, that immese quantity is less than two per cent of the total output of the bituminous mines. This is more clearly indicated by a brief comparison. In the week ending June 30, 1923, when the soft coal mines of the nation were being worked at approximately 40 per cent of their full rate capacity, the total production as announced by the United States Geological Survey was 10,458,000 tons. This week's output would be more than enough to supply every cement mill in the United States with its entire coal requirement for the year.

Or, another form of comparison may be used. The total consumption of coal by the cement industry approximates slightly less than 200,000 tons per week. Seventy three mines grouped in the Fairmont district of West Virginia, alone, have a potential capacity in excess of this amount to the extent of over 20 per cent. The 121 mines located in the central district of Pennsylvania, which operated that particular week at only 61 per cent of rated capacity, produced within 15 per cent of enough coal to supply the needs of the cement industry.

All of the foregoing, however, does not mean to guarantee that coal for cement burning is going to be plentiful and cheap throughout the coming winter. Potential production capacity of the mines is only one factor in supply and price of coal. Coal dug is not necessarily coal ready to burn, for the very important matter of transporting that coal to market has yet to be arranged. And it is in the handling of this detail that every coal shortage which the country has ever known has been brought about. The transportation facilities of the country are not equal and probably never will be equal, to the demands which the peak traffic seasons bring upon them.

By some queer perversity of the human mind, no individual and no industry, generally speaking, can be induced to buy coal in the summer time in anticipation of winter requirements. Thus the coal-hauling burden is thrown on the railroads in the late fall and winter months. Nature insists that grain crops and other agricultural products ripen and are garnered in the fall and must be transported in the same months that coal is being hauled at tip-top speed. It is a fact borne out by statistics compiled by unimpeachable authorities that 60 per cent of the coal has to be hauled in 40 per cent of the year and that the peak comes just when the agricultural peak also arrives.

The dire conspiracy is made complete by the fact that in the winter time railroad efficiency is seriously depleted. An engine that, when the thermometer ranges around fifty to ninety degrees can haul 100 cars is doing well, in zero weather, to get along with fifty. Furthermore, men in cold weather are less efficient, switches are often frozen, and hundreds of operating delays occur. A per diem freight movement of 100 miles in summer will be reduced to 50 in the winter. And occasionally, when the winds from Medicine Hat get in a particularly quarrelsome mood all traffic is suspended for from twelve hours to several days. Therefore, coal on the open market is very apt to be scarce at various and numerous times during the winter. Scarce means high priced, for in no commodity do prices fluctuate more rapidly more widely than they do in coal.

Car Shortage Still Possible

In spite of the great strides which have been made by the railroads in the past twelve months towards a rehabilitation of their tracks and equipment, it is by no means possible that car shortages will be eliminated in the future. As an index of this fact, on so recent a date as August 28th, this year, a large mine in southern Illinois field was compelled to shut down by reason of a car shortage. In the week previously referred to, ending June 30, northern and central Ohio suffered a 15 per cent curtailment in operations due to a car shortage, the Pittsburgh district suffered to the extent of 26 per cent; the Somerset district of Pennsylvania, 27 per cent; the Winding Gulf district of West Virginia 40 per cent and the Hazard district of Kentucky, 62 per cent. The days of car shortage are by no means over.

As was stated above, shortages, from any sources whatsoever, cause price increases. The law of supply and demand works fast in coal. For example, on August 1, this year, it would have been possible to obtain almost any quan-

(Continued on page 39)

The Auditorium at Mooseheart named after Theodore Roosevelt. It is here that assemblages are held.

Mooseheart

A Remarkable Institution for the Care and Training of Children Which Has All of Its Buildings of Permanent Construction

By David Williams

There is no nobler endeavor than caring for homeless children. So think the Loyal Order of the Moose and Mooseheart is the institution through which the ideals of this order of 600,000 Americans are finding expression. Located on a tract of 1,100 acres in the beautiful Fox River Valley, about 35 miles west of Chicago, Mooseheart bears no resemblance to that grist-mill of misfortune—the orphan asylum. The 1,100 children and the grown-ups who look after their needs, live in the wholesome environment of a quiet village with the comforts of a modern city. It is a refreshing exception so far as institutions are concerned, for there is no institutional routine; the children do not wear uniform dress; and the entire surroundings have more of the home atmosphere than is usually seen except around an ideal family fireside. Mooseheart children live in families—little groups of 10 to 20 children, each having separate dormitory building with its own kitchen and dining room. In addition to a central laundry, each dormitory has a small electrically equipped laundry to afford a place of instruction in laundry work for the girls. Every boy and girl who lives at Mooseheart is assured of a good high school education and a well paying trade.

Railway station at Mooseheart.

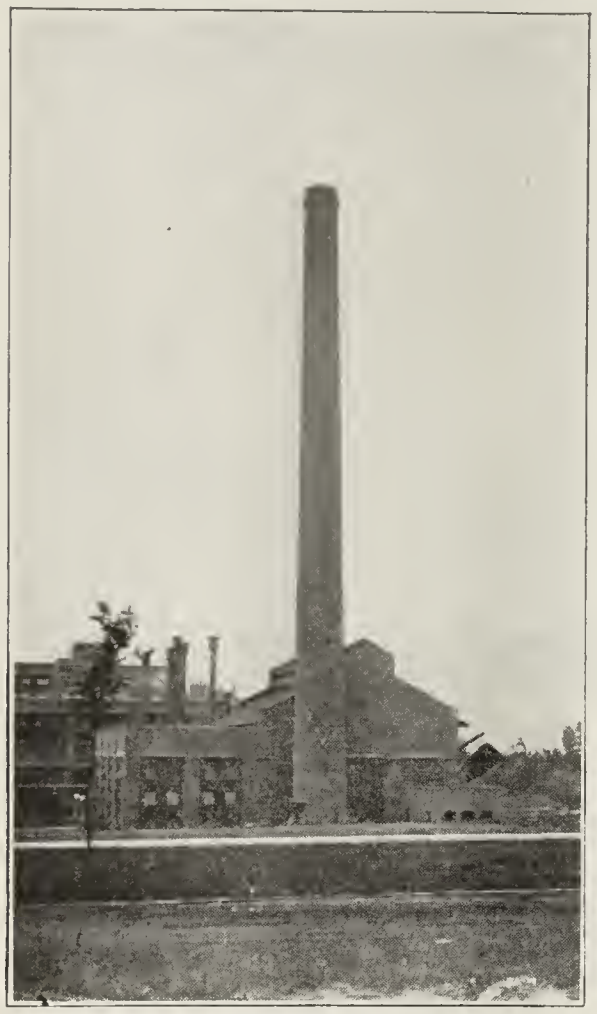
It is evident, even to the most casual visitor, that the hearts as well as the money of the Moose organization have been put into this beautiful place. In admitting children the pledge of the order to care for its orphans is alone considered—age, nationality or religion are not regarded. Provision has been made at Mooseheart to bring up each child in the religion of its parents, although broadly speaking, the institution is nonsectarian.

The architecture at Mooseheart reflects the democratic spirit of the place. The buildings are numerous without monotony, good to look at without the suggestion of extravagance. The building materials and supplies used are made to a considerable extent right on the place in connection with the shops and industries maintained there primarily for the training of the young mechanics. The experiences thus afforded to students is of the most valuable sort, for skilled workmen always work alongside the boys and the latter grow accustomed to seeing all shop and exterior construction operations performed in conformity with the best trade usage.

All the buildings, with the exception of a few minor structures, are of permanent, fireproof construction, for early in the consideration of plans for the village

The front elevation of one of the cottages in the "Baby" village at Mooseheart.

the far-sighted and humanitarian governors resolved that Mooseheart should never have a conflagration. Where there are hundreds of children there are so

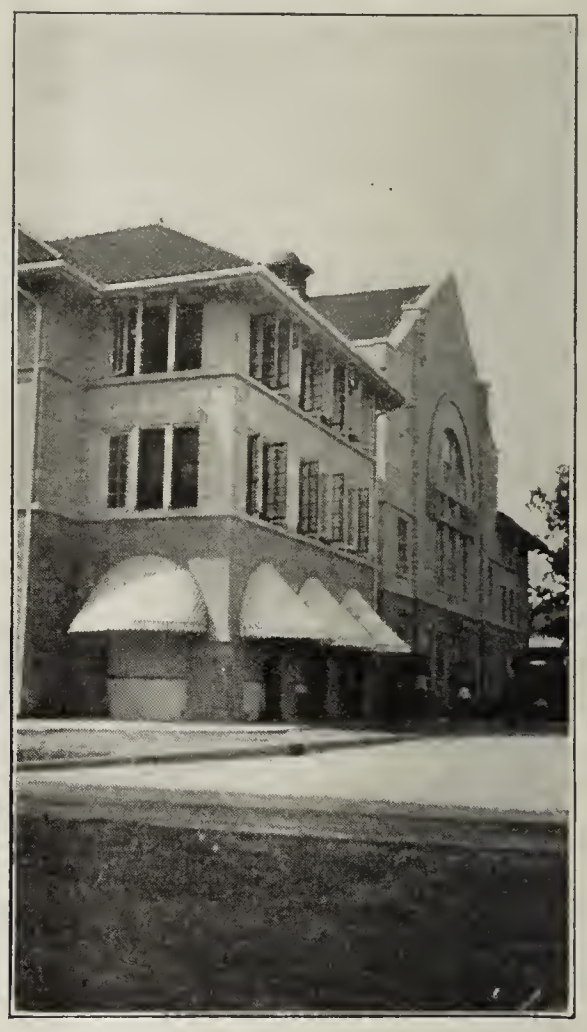


The power and light station.

many chances of fire with terrible consequences that one can see without difficulty why these governors refused to assume the risks which go with inflammable construction. Fortunately, the very highest type of fireproof building was decided on at the start. Since that time standards of fire resistiveness have been rigidly maintained but improvement in economy of building methods and in general appearance of the structures has been constant.

Institutional buildings of this character receive very much harder usage than any ordinary house receives. Just the ordinary wear and tear inflicted by the daily activities of eleven hundred hardy young Americans produces a maintenance problem easier to concede than it is to figure. (An extensive shoe shop at the institution provides over 5000 pairs of new shoes and makes over 10,000 shoe repairs a year.) Building maintenance can be satisfactorily solved in just one way—by using the most substantial material and methods available—actually *building the maintenance* into the structures.

The type of construction selected requires very little outlay for repairs. Painting is reduced to a minimum. Replacement is entirely eliminated. Every additional penny thus saved goes to help more children into Mooseheart. It is a great demonstration of economy and efficiency nobly practiced—not for anyone's financial gain, but in order to serve more children and serve them better. Construction efficiencies at Mooseheart might well be studied and practiced by the entire building industry. Building methods there are quite well standardized and it may seem paradoxical that after standardizing on the best, Mooseheart has been able to make its permanent improvements at costs below usual figures for less dependable construction. Practically all of the buildings have walls



The department store and bank.

below grade are of plain concrete block carrying a coat of pitch. Above grade they are of granite-faced block trimmed with concrete art stone, the floors are of reinforced concrete and the roofs of red tile on wooden framing. The concrete block are light gray in color with a certain sparkle produced by the addition of a small amount of mica spar to the facing. The block faces are plain and flat and the texture smooth enough to shed water freely, although sufficiently rough to avoid hair crazing. The concrete mixture used in the surface to a depth of three-eighths of an inch is composed of white portland cement, white marble in selected sizes, black granite and mica spar. It is interesting to know that this attractive facing has come to be known in Aurora and

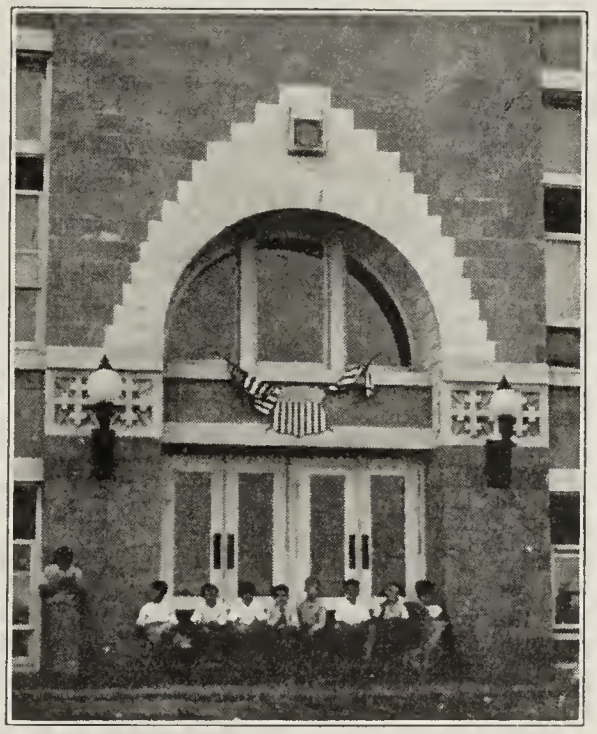
The Campanile. A tribute to Secretary of Labor Davis, the founder of Mooseheart.

At the left, the hospital costing $125,000 devoted entirely to the care of Mooseheart children. At the right is a delightful bungalow known as the East Legion Hall.

surrounding cities by the name of "Mooseheart granite." The block are 9 inches by 24 inches in face dimensions as set in the wall, using ¼ inch struck joints made with portland cement mortar. The block are manufactured by the pressure process, face up, with a compression of 150,000 pounds on each block. As soon as the mold box is removed from the press, the face plate is removed and the face sprayed with a fine spray nozzle, which washes out fine particles of cement and sand, leaving the special stone facing exposed. After a few hours in the curing chamber the block faces are scrubbed with clear water.

The block are then returned to the chamber where they are allowed to remain in an atmosphere of wet steam for a period ranging from 48 to 72 hours, depending on available space in the chambers, and the speed with which it is necessary to make delivery. By raising the steam pressure the saturated atmosphere is made hotter and the curing proceeds more rapidly. After steam curing the blocks are aged in an ordinary open air storage for several days before using, being kept moist during this period, in accordance with the best manufacturing practice.

Two-piece hydrostone wall construction is used, providing for a continuous air space between inner and outer walls. These double walls of T-shaped interlocking block are continued up to the roof lines, producing masonry of the most rigid type imaginable. It is also an almost perfect insulator against the passage of heat and cold and is absolutely fire-resistive. There is a world of difference between ordinary speculative residence construction and the heavy 12-



School entrance with reinforced arch.

inch masonry walls which support the beautiful Mooseheart buildings. All sills, lintels and other special pieces in the walls are made in two sections—inner and outer—with air space between. This is to provide against the dissipation of heat around window and door openings, an extremely important point, often overlooked. The block are of unusually good quality and plaster is applied directly to the face of the inside block with entire satisfaction. All of the block and concrete art stone were produced in Mooseheart's own concrete products plant, which also supplies the highly polished concrete-marble slabs, the lighting standards and the ornamental garden pieces for the institution.

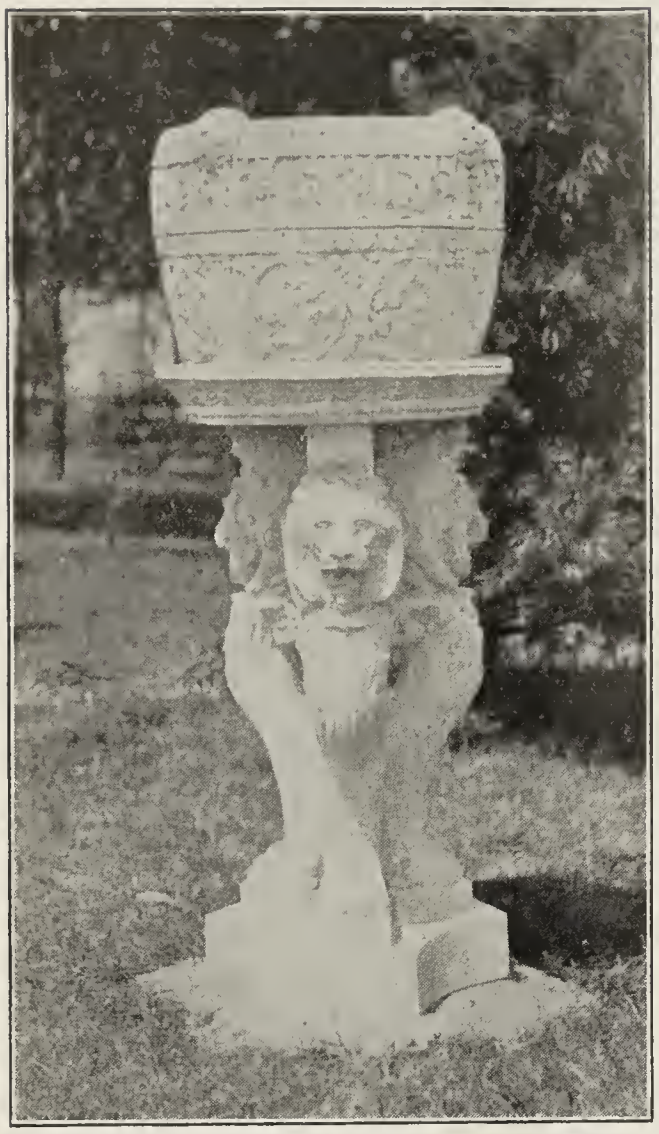
Not only the school, industrial and farm buildings, but throughout the dormitory structures as well, concrete floors have been used with entire success. The longer these terrazzo finished surfaces are in use, the higher polish they take and consequently the easier they are to clean and the more attractive they become. Carefully kept cost data reveals the fact that it has been possible to lay these floors for less money than hardwood on ordinary frame construction. This surprises most of us when we stop to think that concrete floors are chosen for the finest residences regardless of cost.

While some of the earlier concrete floors laid at Mooseheart have hardwood laid over the reinforced slabs and a few are topped with mastic floor coverings, all of the more recent structures have exposed terrazzo finished or enameled concrete floors, which are giving excellent satisfaction. The buildings which house the smallest babies are good cases in point, having terrazzo finished concrete floors covered only with center rugs. No coldness can be noticed about these floors and the children play on

At the left, a $50,000 dairy barn showing concrete silos. At the right, interior of the barn with part of the $100,000 prize herd of Holstein cattle.

them throughout the year without danger of harmful effects.

In the heavier buildings, including the printery, manual training, auditorium, school and some fifteen others, metal sash and metal interior trim were used. In the new $125,000 hospital as well as several other recent buildings, concrete art marble wall slabs have been placed



A garden piece made at Mooseheart.

in the corridors and bath rooms. All of the heavy structural members are of reinforced concrete and half a dozen of the buildings have complete reinforced concrete skeletons.

Like many of the best commercial concrete factories, the concrete products plant at Mooseheart has had to pay for itself as it has gone along. It has not only paid its own way but has financed several extensions to plant and equipment, until to-day it is easily the finest small plant in America. There are two hydrostone block machines, two batch mixers, minor concreting tools too numerous to mention, wood working machinery for making special molds, acid vats for cleaning and etching, an ample equipment of iron pallets, cars and track and extensive supplies of selected aggregates.

Moosheart has concrete shops equipped for clay and plaster modeling, gelatine and other types of molding, general concrete products manufacture, grinding, buffing and polishing of its art marble, and steam curing chambers in which all products are hardened and bleached by exposure to an atmosphere of wet steam for 48 to 72 hours. In addition to supplying its own building needs, this little plant supplies the concrete garden furniture for the largest retailers of New York, Philadelphia and Chicago, several hundred pieces at a time. The beautiful concrete street lighting standards for which Mooseheart is famous may be seen in no less than fifty nearby cities. Quantities of posts have been made at Mooseheart for these cities, usually on request of the town officials and at a nominal profit to the institution, for it is not seeking commercial business and does not care to compete with those who are. From this beginning, however, many manufacturers have become interested and Moosheart has not only offered them the necessary molds at cost, but has also offered to train workmen in the best manufacturing methods. And the building department at Mooseheart in addition to paying its way, trains many boys for the building industry each year, and at no expense to the Order, the industry or the community. During the war it trained 200 expert concrete foremen for the United States Army, who went to France and engaged in the building of military roads and bridges. The concrete training work is under the direction of a nationally known expert, Frank J. Deni.

During the six or seven years since construction actually commenced, there have been completed 50 or more buildings, including dormitories and dwellings; nurseries, grammar school, manual training school, auditorium and general store, power house, printery, laundry, hospital, administrative offices, dairy barn, farm office, piggeries, poultry houses and silos, two or three manufacturing buildings and a canning factory. There are miles of sidewalks and sewers, drain pipes, tunnels and conduits all of concrete, and over half a mile of concrete roadway. The central power house heats and lights the entire institution through a system of concrete conduits which also protect the high pressure fire system; boilers, engines and electrical equipment rest on heavy concrete footings while the smoke is carried far above surrounding buildings by a reinforced concrete chimney 275 feet tall; the printery occupies an entire four-story building and turns out 600,000 copies of one magazine alone, every month. Two other magazines, a monthly and a weekly, are also printed there and all of the printing and mailing for the grand lodge, including hundreds of forms, stationery, etc., come off of the Mooseheart presses. In short, the printing department, wherein many young boys are happy apprentices, are equipped to meet the most exacting requirements of job, newspaper and magazine work. In the printing class there the writer picked out several prospective Franklins and Hardings all intensely absorbed in learning the fine art of printing.

The farm buildings are handsome and immense, taking care of 750-acre farming

This was made by the students.

operations and providing class rooms for the study of agriculture by the boys who elect to become farmers.

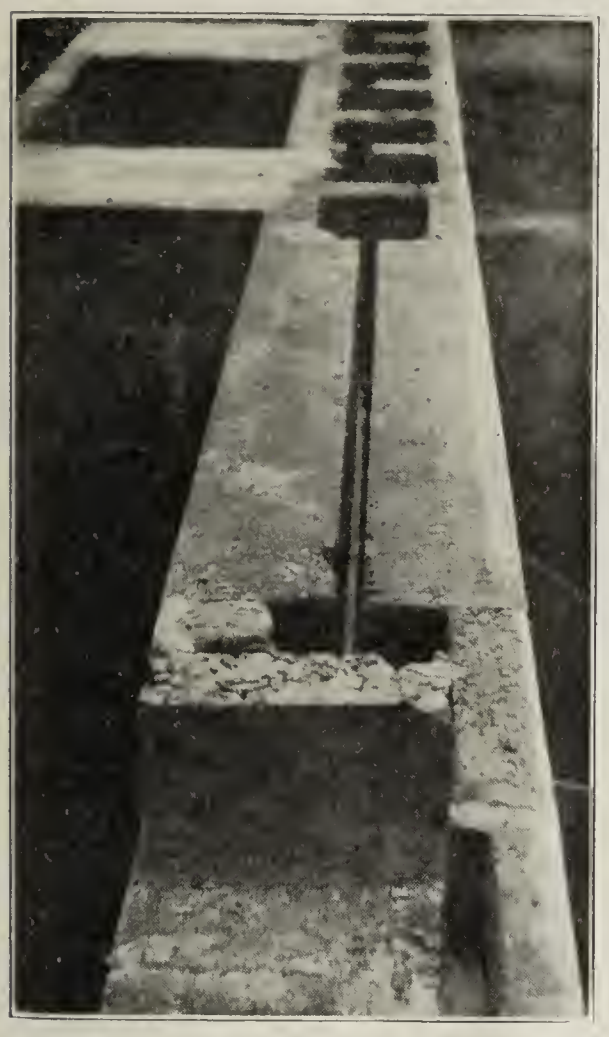
From the big dairy barn the dining rooms receive frequent supplies of rich milk—for Moosheart believes that every growing child should have a quart of milk a day. In the Mooseheart cannery there is produced the "Mooseheart Brand" of canned vegetables, for which grocers in nearby cities are glad to exchange such staples as sugar, spices and flavoring extracts.

Reducing dairy efficiency to final terms, Mooseheart recently imported one of the finest herds of milch goats in America, in order to provide the best obtainable form of nourishment for weak and sickly children. One of the big sights at present is the flourishing group of young "nannies" recently born at the institution. And be it said that husky horns and the well known goat appetite for all that's to be picked up, have no terrors for the great concrete barn which

One of the twenty-five merry-go-rounds showing school house in the background.

already houses the great Holstein bull which heads the bovine herd.

As an illustration of the ingenuity used in bringing the place to the height of utilitarian perfection, a concrete dam was built in a small creek running through



Double block wall with continuous air space.

the property and in this way a delightful forty acre lake has been formed which is entirely surrounded by the property and gives the boys and girls a delightful place to bathe and a safe place to learn to swim.

The Baby Village

One of the latest bits of architectural development at Mooseheart is the "Baby Village". It consists of five buildings,

Showing floor construction.

four dormitories and a mother house, arranged in a half circle around a large center fountain and garden. The feeling is almost that of a stately group of palatial residences, and there is no suggestion of institutionalism or even a hint that they shelter children without the good fortune of parental homes. The buildings have double walls of the standard type previously mentioned, ornamented with concrete dimension stone of identical color and texture. Floors are of reinforced concrete throughout, surfaced in a pleasing terrazzo, polished and waxed.

The porticos are characteristically Italian with cast granite balustrades and spindles, decorated with flower urns of the same material and rectangular flower boxes on ornamental concrete brackets, both boxes and brackets being "built in" as an integral part of the wall. A beautiful frieze forms delightfully pleasing belt course, surrounding the entire buildings, just below the eaves. Red Spanish tile have been used on the roofs—which have been given low pitch and broad protecting overhang. Porticos are floored with dark red floor tile laid with slate mortar on concrete slabs.

To avoid stairs, a very undesirable feature in buildings to house small children, all of the living rooms have been placed on one floor, although each house has a commodious basement with laundry and storerooms for food and other supplies.

Secretary of Labor James J. Davis, who was a close personal friend of President Harding's, has been director-general of Mooseheart since its inception, and Robert F. Havlik, well known as chairman of the Committee on Concrete Products of the American Concrete Institute for several years, has been in charge of all construction work. Others who contribute substantially to the success of this unique institution include Past Supreme Dictator Ford of Philadelphia, Rodney Brandon, supreme secretary, and Matthew Adams, the superintendent. Knox & Elliot, Cleveland, were the original architects, but the more recent construction and landscaping have been by Graham, Anderson, Probst & White, of Chicago. The completion of the project at a total expenditure of $6,000,000 or more for buildings, is expected to require three or four years.

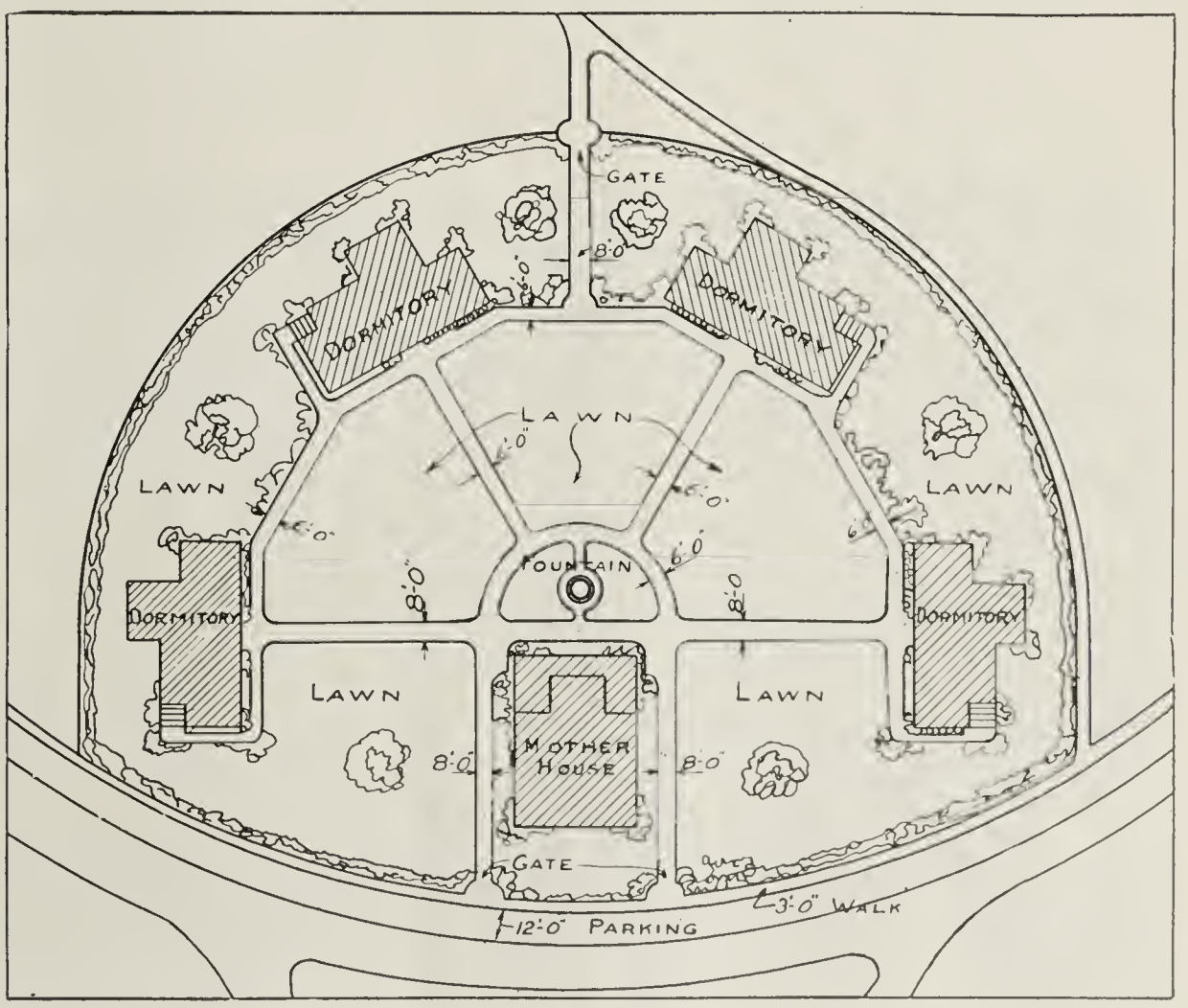
The method of financing Mooseheart is one of the unique characteristics of this great home and school. Plans for the magnificent construction scheme, as well as current maintenance, are provided for entirely by a fund raised through the payment of $2 per year by each member of the lodge, together with a number of handsome gifts from individual lodges and groups of lodges.

The 600,000 members of the order, all participating, raise an annual fund of $1,200,000 according to the plan. Each member who thus participates receives the assurance that in case of death or

The Mooseheart printery.

disability his family will be cared for and his children will receive a home and training which he could insure in no other way—for it would be entirely out of the question for most of the Moose members to finance enough life insurance to similarly take care of the children.

Mooseheart is notable indeed, because it is pointing the way architecturally and structurally for similar institutions. Every building has been designed and constructed for its own purpose, and almost every building constitutes a distinct contribution in the field of institutional design and construction. Mooseheart is an achievement of which any fraternal order could be proud and probably stands without equal today, not only in size, the scope and the efficiency of its management, but particularly in the high standard and the extent of its permanent building operations.



Detail of grouping for "Baby" village.

The Strong Arm of Industry

A Discussion of the Modern Power Shovels Now Indispensable in the Handling of Great Masses of Raw Material at Lowest Possible Cost

Probably excavation of dirt and other natural materials was not as important in the earlier days as it now is. At any rate, engineers in those times knew that a good man could shovel about a cubic yard of loose dirt in an hour and that they might, if they were fortunate enough, to find a man who could boost the average to a cubic yard and a half. Then in about 1840 a certain Mr. Otis is said to have applied his theory that dirt could be moved cheaper by power than by human labor and so introduced to the world his first crude steam shovel. It was not until 1864 that his invention was brought to a stage of development which would warrant manufacture. In that year the Otis Company was formed in Boston to construct a few crude models, destined to be the predecessors of today's speedy, awe-inspiring giants, monsters which at one bite carry enough material to load a dinky.

Today the fight for the superiority of power over hand shovels is practically over on jobs which are big enough to warrant the purchase of equipment, for machine excavation methods have amply proved their effectiveness and economy. Just to make more forceful the comparison between hand and power shoveling, let us take the example of the Panama Canal. About three hundred millon cubic feet of material were moved there. Suppose one thousand men had been put to work to get rid of the material by hand shovels. They would have had to work full eight hour shifts for 37,500 days or, counting three hundred working days to the year, for one hundred and twenty-five years, to dig the big ditch. If, however, those men had been working the present-day monster steam shovels, they could have dug the ditch in forty-six and two-thirds days! This example, roughly calculated, serves to give an idea of the tremendous saving of time effected by the use of power shovels, and shows plainly that present day undertakings would be out of the question if Otis or someone else had not put power to work.

Today the question does not relate to the economy arising from the use of power, but it deals with the type of equipment to be used, whether steam, gasoline or electric. There seem to be talking points for each kind, and each seems to possess certain distinct advantages over the others under certain conditions. Any dogmatic statement, therefore, as to which is universally the best is likely to lead to argument.

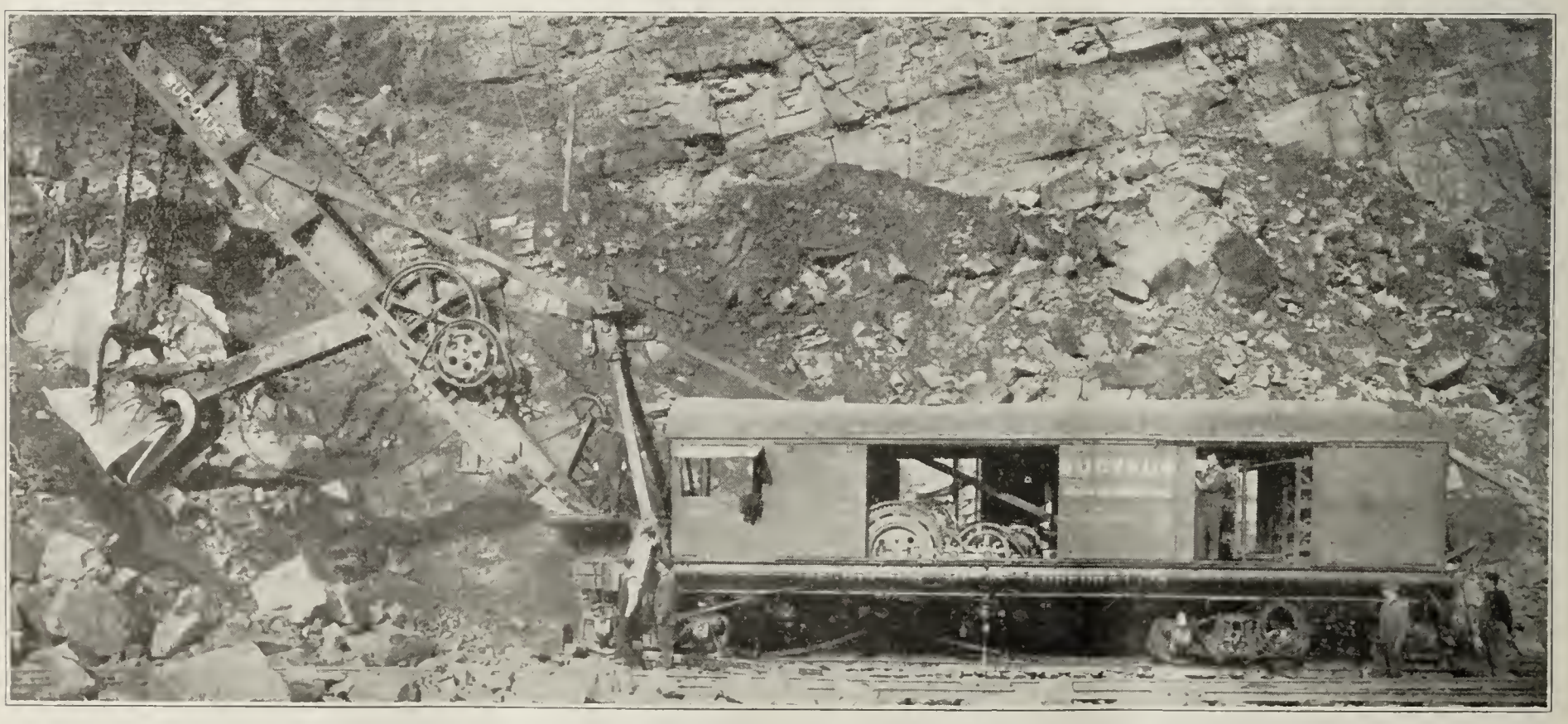
Fundamental Principles

The fundamental principles of all power shovels are just the same. Each involves three motions. The first is the advancing or crowding motion, which brings the excavating tool into contact with the surface to be removed. Then the second motion lifts and loads the container. Both of these motions are in the vertical plane, as their ultimate object is to lift. After the material has been dug out, it must be swung around horizontally, to be piled up or to be loaded into the empty conveyor. Crowding, hoisting and swinging are to be found in every power shovel, no matter of what type, but it is in the application of power, in the creation of the necessary forces, that designers have met with trouble. Shall there be one, two, three or four separate and distinct power units, and what shall propel them? That has long been a problem, one which is each year becoming more acute. Indeed, some men even go so far as to say now that the steam shovel in small sizes is a thing of the past, as it is being supplanted by either gasoline or electric equipment, but that in the larger sizes, say those with bucket capacities of over a yard and a half, the steam shovel cannot be supplanted by either of the other two types. Most men, however, are more conservative in their statements, preferring to survey conditions accurately before prescribing the correct equipment. As a matter of fact the choice of the particular type of power is often pretty much a matter of fancy. Let it be understood here, though, that this article is not making any attempt whatever to defend any one kind of shovel, but that it is rather attempting to survey as fully as possible the opinions of others who deal daily with the problem. Their own variation in opinions is ample proof of the fact that no one type can be acclaimed universally superior to all of its competitors.

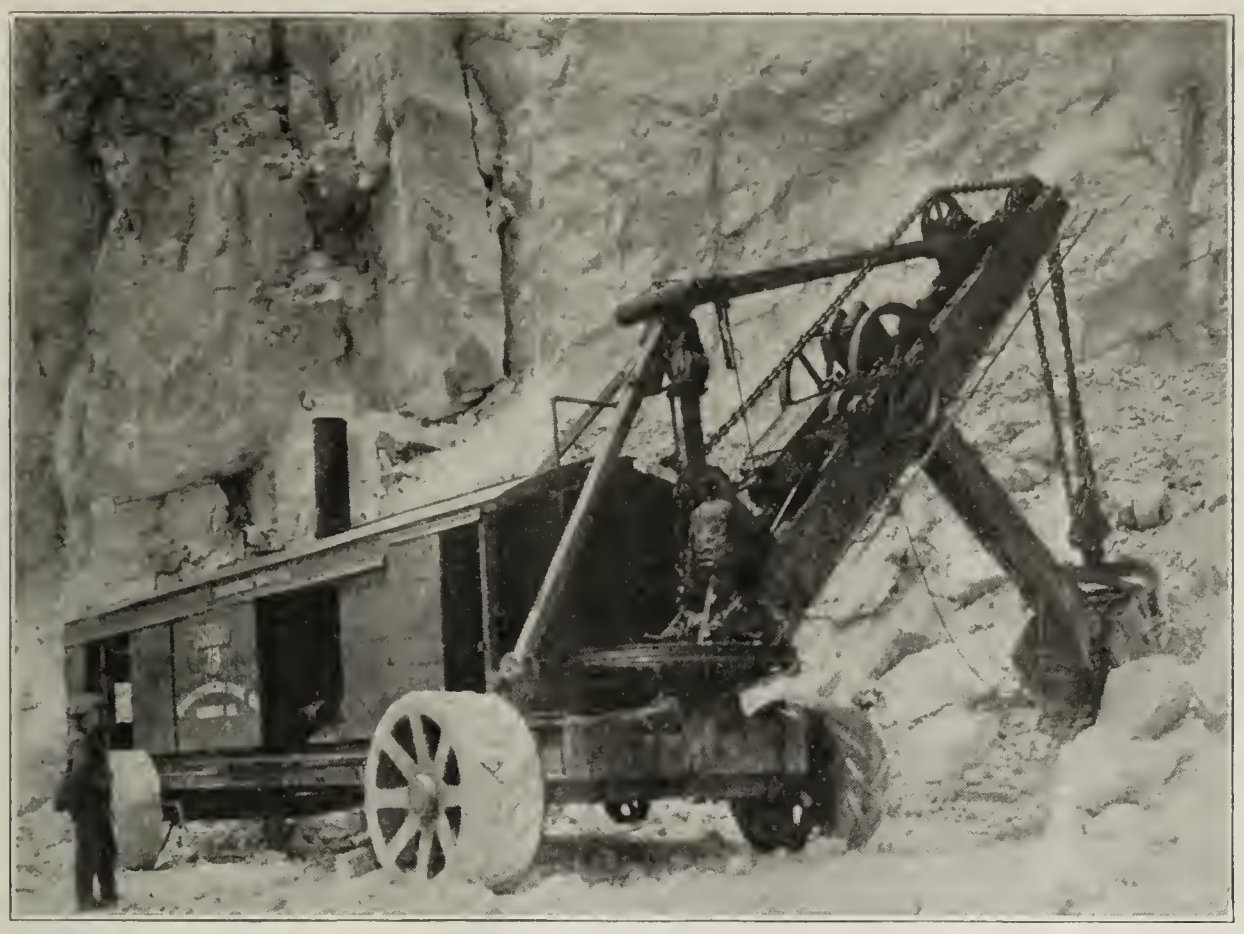
At the outset let us dispose of the question of the initial cost. If the job is big enough to warrant the use of a power shovel, the cost of the installation usually does not mean a great deal. What the engineer must worry about is rather the cost of operation. He must determine just which type will be the most economical to use. The question resolves itself when analyzed into one similar to the opinion often versed concerning Kodaks and Fords—"It's not the initial cost so much as the upkeep."

"We find the steam driven shovel preferable to any other type of drive, but the electric is equally efficient and costs no more so that it is generally used in quarries and places where the machine is not to be moved around over very large areas and where electric power is available," says one man who evidently is not an exponent of the merits of gasoline.

Another, however, points out that "the demand for gasoline driven shovels has increased by leaps and bounds during the past five years. This may be explained by their adaptability to local conditions, economy of operation and absence of fuel and water hauling troubles. These machines have proved that they not only have tremendous digging



A Bucyrus electric shovel in the stone quarries of the Bethlehem Mines Corporation at Bethlehem, Pa.



An Osgood steam shovel with steel wheels at the plant of the Elmhurst Chicago Stone Company, Elmhurst, Ill.

power and high output, but that their operating costs are far below those of any other type of power shovel. Shovel users who have watched the development of gasoline shovels are now fully convinced that they are successful and that they have fulfilled every requirement of a power shovel."

"Wherever you can use a gasoline truck you do so, don't you?" replied one man when questioned concerning the advantages of the gasoline shovels. "You wouldn't consider putting a steam outfit on your truck for you know that gasoline is cheaper and more satisfactory. Why not apply that same reasoning to the power shovel? It's logical."

Other Power Than Steam

A nationally known manufacturer, apparently in favor of the newer gasoline and electric shovels says that "ten to fifteen years ago the electric and gasoline power shovel was looked upon as an experiment, and was considered an impossibility. At that time very little was known about internal combustion engines. Their adaptability had not been determined and their use was confined mostly to minor installations. What few engines there were seemed in no way adapted to the rigorous demands of equipment in the excavating field. The cost of electricity for power purposes was almost prohibitive and as a consequence not much thought was given to machines of that type. Today this attitude has entirely changed, as is evidenced by the large number of electric and gasoline shovels in successful operation and the growing tendency toward their use."

Then he begins discussing the evils often attributed to the other shovels and how they are overcome by the electric and gas type. Gasoline and electric shovels are put in the same category for this comparison for neither must be fired and the gas shovel, because of the fact that the radiator may be drained in cold weather or anti-freeze solutions may be used, eliminating the water question almost to the same extent as does the electric. Thus their operating conditions are practically analogous. He says, "first of all, the handling of fuel for a steam machine has always been an expensive and arduous task about any construction project. Coal must be handled from storage or car, regardless of the working conditions or location of the machine. Then too, the problem of good feed water is always an important one, and its solution often involves expense in water softening devices, filters, purifiers and boiler cleansing compounds. Freeze-ups in winter are a continual source of inconvenience and unless pipes and engines are properly drained or protected there is an ever-present danger of serious delays. Smoke ordinances are now in force in many cities and regulations controlling the use and handling of steam boilers are becoming more severe each year.

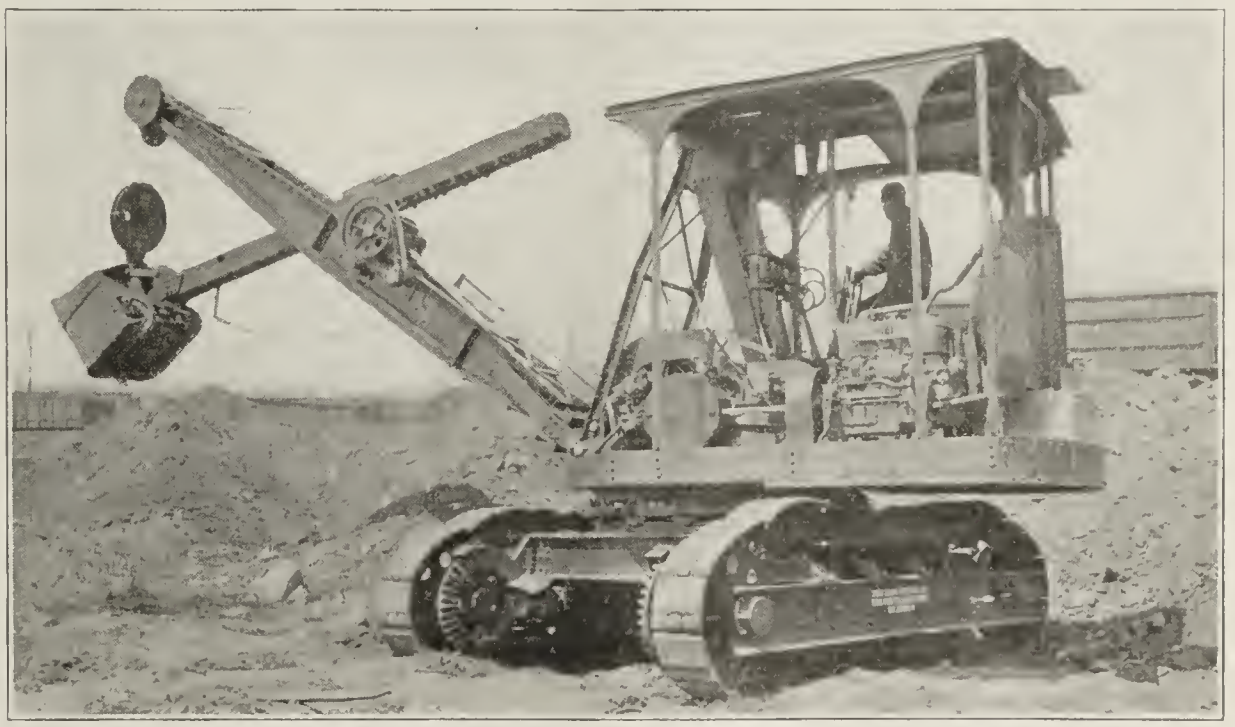
"It is only natural then, that many industries requiring power excavators should be actively engaged in the electrification of their equipment. Cheap hydro-electric power is now available in many localities and new projects are continually under construction. High voltage transmission lines carry this power to great distances with but little loss and at remarkably low cost. Where such power is not available it can often be generated in central stations where efficient methods of handling fuel and water can be arranged."

This opinion probably outlines in the most illuminating manner the claims of the electric type of shovel. Gasoline, however, is far from being without proponents, as is seen from the opinion voiced by one man, in which, although he discourages the use of steam for most smaller installations, he takes up the issue for both gasoline and electric shovels, adding, however, the assertion that steam cannot be replaced in the larger units.

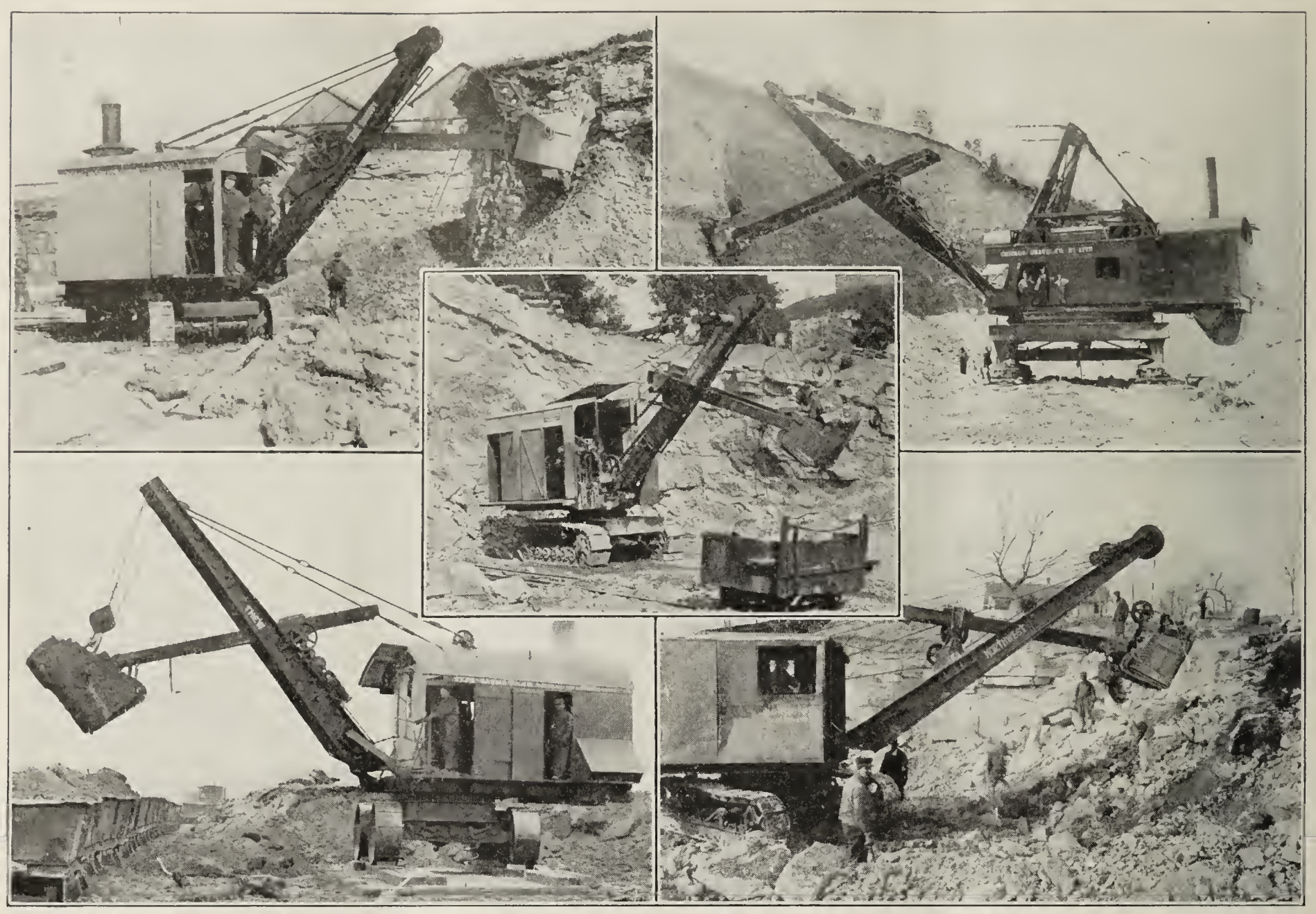
"One of the principal features of the gasoline or electric shovel is their one man operation. The fireman and watchman are eliminated and the saving in their wages is a large item." Then he adds that "there is no delay or extra working time required for bringing up steam or for banking fires when work is over and no night watchman is required. The expense stops when the engine stops. Fuel and water hauling expense is practically eliminated. This not only results in large savings but it also makes possible the operation of these machines in inaccessible places where it would be almost impossible to successfully operate steam rigs. Another item that means larger profits from gasoline shovel operation is the absence of water troubles. There is no danger of freezing in cold weather for the radiator of the gasoline machine may be quickly drained. No chemicals are needed for purification purposes and no time is lost for taking on water.

Steam for the Big Job

"Steam shovels are most applicable on very large sizes of two yards capacity and up. I refer now to the large railroad type shovels which are used particularly in the cement mill industry for loading rock. For smaller quarry work the gasoline or electric machine is preferable and I believe it is now no false prediction to make that in ten years the small revolving steam shovel will be a thing of the past. The gas machine is so much superior in its operating characteristics as well as in economy of operation that shovel users will be forced to



An Orton & Steinbrenner gasoline shovel equipped with caterpillar traction.



A group of the giants of industry. At the upper left, an Erie steam shovel mounted on a wide rim wheel. Upper right, a Bucyrus steam shovel operating for the Chicago Gravel Company. In the center, a caterpillar type of electric shovel built by the Pawling & Harnischfeger Company. In the lower left, a Thew steam shovel mounted on wide rim wheels. Lower right, a Northwest shovel mounted on caterpillar traction.

the gasoline machine to meet competition. The electric shovel is of course very desirable where there is not much moving as in a quarry gravel pit or clay pit. Electricity is ideal because it is about as near fool-proof as anything can be made."

It might be well to add here the opinion of another observer who says that "gasoline is the ideal fuel in many localities where coal is not available or is prohibitive in price or where the water supply is scarce or unfit for use."

Approaching the subject from a more conservative viewpoint another conceded authority says, "in selecting power shovel equipment many factors should be taken into consideration. Steam has certain inherent characteristics and advantages that should not be neglected. In proposing a change from steam to electric operation we have to deal with steam equipment which has not only proved its worth in power shovel construction, but has probably reached its highest stage of development."

Then he starts his defense of the all-electric type by saying that "electric shovels have a wide field of application. In stone quarries, lime and cement plants, and open mines, boiler feed water is usually unfit for use, due to a high mineral or vegetable content. In these industries electric power has many advantages."

Our observer, taking up the problem of shovel work in isolated localities, recommends the gasoline-electric type in which the gasoline motor drives an electric generator right on the shovel. "With this type the fuel problem is practically eliminated. Besides, all the advantages of electric operation are maintained, with the same efficiency and with equal economy in operation."

While a great deal of the testimony above may overlap, it might be well to recall here the survey of the situation as revealed by one who has made quite a thorough study of the whole question. In summing up the superiority of gasoline and electric shovels, with their modifications, over the steam equipment, taking for granted the fact that any of the three types may be used, he says, "gas and electric shovels often have preference for various reasons. The cost of a night watchman to keep up fires is eliminated; there is no loss of time on the part of the operators while they are getting up the steam in the morning; there are no water troubles, due to poor quality or quantity; there are no shutdowns because boiler tubes must be cleaned often; the expense of the fireman is saved; the new types are cleaner especially for city work, and eliminate the danger of fire from sparks; they cause less worry from the fuel angle, as the owner does not have to bother about the frequent and threatened coal strikes with the incidental jump of price of his fuel; there is no bulky fuel to transport, a particularly important consideration when the shovel is being operated in a place difficult to reach; and there are no ashes to remove." This resume would no doubt cover all the points in as quick a manner as they could be recalled.

From this discussion, however, it should not be assumed that the steam shovel is a thing of the past. Indeed it is not. In some types it will probably never meet serious competition. Gasoline and electric shovels may be most advantageous for small installations, as they eliminate quite a little waste and expense. Then too, they are said to enjoy rather unusual flexibility. But most men agree that the gasoline shovel can never be made in the large sizes, for a gasoline motor, to furnish the necessary power, would have to be too bulky to be practical. Oversized engines would no doubt bring on complications which engineers are not at present able to solve. Then too it must be remembered that there is a limit to the size of engine that can be started by hand power, and hand power is the only present available means of starting one. If an engine could be built to take care of the heavy loads on the big shovels, it might be found impossible to turn it over. That at the outset would eliminate this type from competition in the larger sizes.

Electric equipment is limited in the scope of its practical use. It can be employed only where there is an available supply of electricity. Moreover, it is not practical where the shovel has to be moved from place to place, as often it

would be found impossible to supply current to the machine. In some quarries and pits, however, where the shovel makes no major movements and never has to be loaded on a car and taken some place else, the use of this shovel might effect a saving. As a matter of fact it has performed quite satisfactorily in such operations as the handling of coal at plants, where its position rarely changes.

So while the newer types of equipment possess many theoretical advantages, their application is often found impossible and costly. They will never supplant the steam shovel entirely, it seems, and, according to manufacturers who make all three types, can never compete successfully in the larger sizes with the giant steam installations.

Some Comparisons

A rather interesting side light, in case any of the three types can be used, is brought out in the table published concerning the comparative cost of operation of steam, electric, and gasoline electric Marion shovels of ¾ yard capacity. The table is reproduced below:

Comparative Operating Cost—Based on data of actual experiences covering a wide range of working conditions of various types reported from many different localities
Steam, Electric, and Gasoline-Electric Shovels

	Steam	Electric	Gasoline-Electric
Operator	$ 8.00	$ 8.00	$ 8.00
Fireman	6.00	None	None
Pitman	4.00	4.00	4.00
Coal, 1 ton (at $8.00 del.)	8.00	None	None
Gasoline, 35 gal. at .25	None	None	8.75
Power, 225 K. W. hours at .03	None	6.75	None
Water Supply	1.25	None	None
Oil and Minor Supplies	1.25	.50	1.00
Operating Cost	$28.50	$19.25	$21.75
Interest at 6%	2.90	3.60	4.10
Depreciation, Maintenance	4.80	4.50	5.50
Total Cost per day	$36.20	$27.35	$31.35

Another manufacturer figures on the basis of savings rather than operating costs. Although some of the figures here are at variance with those above, it will be noted that each estimates that thirty-five gallons of gasoline do the work of one ton of coal in power shovel operation. The Northwest figures follow:

Daily Operating Costs:

	Gas	Steam	Saving
Engineer	$	$	Same
Helper (if required)	.....	.....	Same
Oil, Grease and Waste	1.25	.....	Same
Gasoline (25 gal. at 20c); Coal (¾ ton at $8.00)	5.00	6.00	$ 1.00
Team for Carrying Coal and Water (½ day at $8.00)	None	4.00	4.00
Fireman	None	5.00	5.00
Overtime for Firing-up in Morning and Pulling Fires	None	2.00	2.00
		Daily savings	$12.00

There are, of course, many other things to be taken into consideration when installing a power shovel. There naturally is a decision to be made concerning the type of traction. The choice lies, generally speaking, between crawler, wide rim wheel, rubber tired wheel, and railroad mounting. The kind decided upon depends largely upon the type of work to be done, the frequency of major moves which will have to be made by the shovel, and how they are to be made. Each type of traction too, has ramifications, each one of which is supposedly designed to take care of particular conditions, but here again the choice is often a matter of fancy and opinion.

Whether there be one, two, three or four separate motors, no matter what their fuel may be, is again a matter of conjecture. Some men prefer to have the minimum number of separate power units, resorting to the use of clutches and chain, rope, or gear drives to supply power to the various parts of the shovel. Others believe that the friction clutches bring on unnecessary evils, and instead prefer to have the power supplied where it is needed by a separate motive unit. In trying to find out which is the more desirable type from this viewpoint, we are apt to run into a stone wall, as each manufacturer naturally believes in his own design to the relative exclusion of all others, and each can point out performance records which will seem to substantiate his opinion. Standardization in design of power shovels would be as hard to obtain as it would be in the automobile industry. Each probably has its own advantages and its own disadvantages, and any attempt to combine them so as to obtain the "ideal" machine would lead to a labyrinth of complications and unending effort to sift out what is really the best.

WASHINGTON, August 28.—The Superior Portland Cement Company has applied to the Federal Power Commission for a license for a short section of its water conduit crossing a small tract of public land near Jackman Creek, a tributary of the Skagit River, Skagit County, Washington. The plant will develop about 26,000 horse power, to be used in manufacturing cement.

A giant among giants. The largest revolving power shovel ever built, constructed by the Marion Steam Shovel Company of Marion, Ohio, and in use by the Oliver Iron Mining Company.

Study Effect of Moisture on Concrete Slabs

Concrete road building, although now being carried on on a big scale, is after all a young science about which engineers have just scratched the surface. The attempt to design and construct a perfect road, one which will give maximum service with the least incident expense, has been the subject of no little investigation, investigation which had a recent climax in the tests conducted on the Bates experimental road in Illinois. Even that research did not include all of the problems of highway construction, however, for its tests were preponderately practical; that is, different sections of various kinds of road were subjected to actual traffic tests to see which would last the longest.

In recent years concrete has been the object of extensive scientific investigation because of its evident peculiarities. It is known that absorption of heat and moisture both cause expansion of concrete products. When a road slab expands due to lack of uniformity in taking up heat and moisture, the edges press down on the subsoil because of the curling action of the unit and the fibres of concrete are subject to what are known as primary stresses. If a road under these conditions is subjected to heavy traffic, it would be more liable to failure than would the normal surface. As a matter of fact, here is the way the stresses come about. If the top of the slab expands because of external conditions, while the lower part is not subjected to those changes, the slab tends to curl, causing the bottom surface to be compressed, as in figure 2. Consequently we would have the road humping up in the middle; but the weight of the slab itself exerts a pressure on the road which tends to take out the hump. In so doing it increases the internal stresses which already exist in the slab. It can thus be easily seen that under such conditions the unit is under abnormal internal tension and compression, so that the addition of a load as in figure 3, passing over the surface could exert enough pressure to rupture some of the concrete fibres. It is a continuation of these primary and secondary load stresses which cause the failure of concrete roads.

Now if a slab could be uniformly heated or uniformly moistened, expansion only would result. The slab would get bigger without being distorted. But such conditions do not exist on a road. The sun, for instance, beats down on the surface, causing it to expand while the lower part remains cool and tries to retain its normal size. This leads to the heat problem, which was quite thoroughly investigated several years ago. Results showed that the uneven heating of surfaces does have the effect of weakening the concrete. Now, however, the United States Bureau of Public Roads, in conjunction with the Engineering Experiment Station of Purdue University, is conducting an extensive series of tests to determine just what the effect of uneven distribution of moisture in concrete and the freezing of that uneven moisture has upon the load carrying capacity of the product.

Problem Is Complex

The problem being worked on now is plainly more intricate than that of the effect of heat. Heat strikes only the upper surface. Moisture, however, may be found on the bottom of the slab because of the water retained by the sub soil, while it may also occur on the top due to rain, dew, or other causes. We thus have the unique condition of expansion of the top and bottom layers, with the middle layer tending to remain practically the same. Consequently more complicated internal stresses are set up.

Water expands about an eighth of its volume by freezing. Now if the top and bottom layers are already expanded due to moisture, and if that moisture is frozen, causing still greater expansion, it can easily be seen that the stresses under these conditions are appreciable. We must remember that freezing water will cause an iron pipe to burst. Now if concrete, already distorted because of uneven distribution of moisture, is subjected to those conditions, alternate stresses and strains subject the substance to tremendous internal forces, which may break up the slab just as easily as the continued application of traffic, assuming of course that a greater amount of time would be required in the latter event.

In the tests now being conducted, seventy-five slabs, each four feet long, eight inches wide, and six inches deep, are being used. All of the slabs are of the same mixture, conforming to the average specifications for State Highway commissions. The aggregates are carefully screened and graded, and the whole mix is made with as high a degree of mathematical precision as is practical. A specially constructed testing machine, by virtue of which the slab is thoroughly clamped on one end to make a cantilever beam of it, allows each slab to be broken four times. Two breaks will be made while the slab is in the natural position, the average of the two being taken as the normal breaking strength. The remaining parts of the slabs will be subjected to moisture to various depths on both top and bottom, thus giving the widest possible range of non-uniform moisture. While they are in this state they will again be broken twice, the average being taken as the breaking strength under the given abnormal conditions. The difference between the two average breaking strengths of a given slab will represent the additional strength, or more likely, the degree of weakness, caused in the slab by the abnormal conditions. The machine is so constructed that the beam can be broken in less than two minutes, quite a saving of time over old devices. This allows accurate control of the position of the moisture, so that there is not sufficient time for the water to distribute itself uniformly over the entire slab by capillary action.

Plan Freezing Tests

Similar tests will be conducted on slabs in which the moisture has been frozen, a thing made possible because the machine acts quickly enough to make the break before thawing occurs.

Throughout the tests corrections will be made for temperature changes and all slabs used will, before moistening, be of approximately the same dryness. A special drying oven has been constructed so that dryness and temperature may be controlled. It is hoped in this way to eliminate as many as possible of the variable factors so that the tests will predict most accurately the actual results of moisture and freezing on the concrete unit. Then too, movements during the tests will be accurately recorded so as to simplify data as to the amount of curling action caused by each treatment. This curling action has, of course, been noted in previous investigations, but so far as can be learned, no research to date has taken into account the variation in actual strength caused by moisture changes and conditions.

Because of the fact that concrete, possessing always a variability in aggregates, varies widely in strength, relative inaccuracy of results would normally be expected. Two slabs made of the same mixture may vary as high as twenty per cent in strength, even though every normal precaution has been taken to make them both exactly the same. The error incident to this variation will be considerably reduced because each beam is being broken twice and the average breaking strength taken so as to make each slab a separate testing unit. It has been found by past observation that the breaking strengths of two sections of the same bar are not likely to have such a wide degree of variation except under exceptional and freak conditions.

Prof. R. B. Crepps, of the University testing materials department, and Mr. A. C. Benkelman, research specialist for the Bureau of Public Roads, along with a staff of advisors and assistants, have been working on the project for almost a year now, but no definite results may be expected at least for another year. When the final data and conclusions are assembled, however, there is little doubt but that information of great value to road builders will be found in the report.

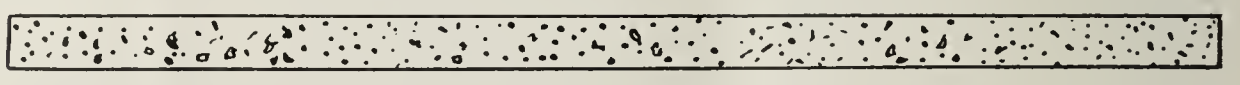


Fig. 1.—Showing normal flat concrete slab.

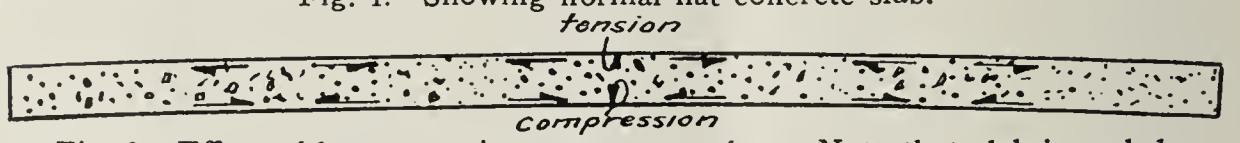


Fig. 2.—Effect of heat or moisture on top surface. Note that slab is curled.

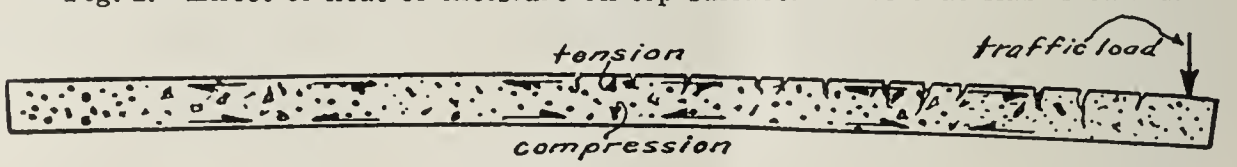


Fig. 3.—Possible effect of traffic load on slab shown in Fig. 2. Curling action exaggerated in drawing for clearness.

New Concrete Roofing Slab Has Unique Features

Interesting developments in the making and use of light weight concrete slabs are brought out by the process of manufacture and the application of the product of the Porete Manufacturing Company of Newark, N. J. Because of the spongy effect of the concrete produced, its weight is only about one-third of that of the ordinary slab. As a matter of fact, the sheets of concrete average only fifty-five pounds per cubic foot in weight and will withstand a crushing force of six hundred pounds per square inch.

The method used in making the slabs is rather unique and interesting. Pellets, varying from one-sixteenth to one-eighth of an inch in diameter, are made of a wax-like substance resembling paraffin, a material which remains solid at ordinary temperatures but melts easily in hot water. These pellets are used as the "coarse aggregate," enough cement and sand being added to make the mix consist of one part of sand, three of cement, and seven of the wax pellets. This is mixed with water and is fed by an automatic hopper into steel forms in which expanded metal reinforcing has been placed on supports about one-fourth inch from the bottom. After the forms have been levelled off with a hand trowel they are set into racks until evening, when they are put by an electric hoist mounted on a travelling crane into warm water, so that the setting process may be accurately regulated.

The setting process is sufficiently advanced by morning to allow the removal of the slabs from the forms. Because of the fact that the pellet material is more valuable than the concrete itself, it must now be removed as completely as possible. To accomplish this, the slabs are put into a coal heated oven which contains also an inlet for steam. As the slabs heat up, the wax melts and runs through an opening in the bottom of the oven. Then superheated steam is introduced to vaporize what remains of the pellets. This vapor goes out the top of the oven to water cooled condensers, so regulated that the pellet material remains liquid and can run out to the vat which already contains the wax removed by oven heating.

A finishing layer of concrete may be added if more strength is desired. The metal reinforcing takes care of the tension, so that the additional layer allows more compressive possibility for the entire slab. Adding concrete to the top surface is made easier because that portion is left rough by the manufacturing process. Thus it may be faced with concrete for smoothness in roofing and flooring work, or with stucco for construction purposes. The slabs may be nailed directly to wood without injury, or may be clipped satisfactorily to steel beams.

They also form excellent roofing material because of their lightness and because of the fact that they can carry a live load of forty pounds per square foot, with a safety factor of six. Then too, they may be used as a base for slate or tile roofs, for nails may be driven into the Porete just as easily as into wood after the special nail finish has been added to the rough surface. Owing to the peculiar air cell construction of the slabs, it is said that the material is as good in heat and sound insulating qualities as wood.

Courtesy Scientific American.

Laying the Slabs on Concrete Girders.

Courtesy Scientific American.

Workmen Adding Waterproofing Layer to Porete Roof.

Courtesy Scientific American.

Adding Finishing Layer of Concrete to Roof Already Laid.

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Cut Off the Inch

Someone has said that if an inch were cut off the bottom of every Chinaman's shirt, the price of cotton would be reduced one cent a pound because of the reduction in demand. There are about four hundred million Chinamen. The manufacturers of the famous Uneeda biscuit rounded the corners of that biscuit, thereby saving dough enough to increase their dividends perceptibly each year. A well known paint firm, not wishing to decrease the quality of its product, but seeking some way to increase its earnings, put stickers on its cans instead of putting wrappers all the way around. In view of a huge output, the decreased production costs were noticeable on the company's books at the end of the year. Hundreds of similar instances can be cited, but they all point out one moral. Profits and increased earnings are often the reward for paying attention to details which most people assume to be matters of routine. The public thinks none the less of the Uneeda biscuit because its corners are clipped, it does not hesitate to buy paint because the can is not encircled by a wrapper, and the product in itself has not slipped an iota in quality.

Business failures each year involve millions of dollars in this country alone. Even in periods of prosperity those failures take place every day, not always because of the overcrowded conditions, but because the men who run them are not cutting the corners. Science and engineering have demonstrated irrevocably during the past decade that there is a shorter and cheaper way of doing nearly everything. A time study man happened to be watching a certain world's champion. The champion was a girl, and her ability lay in being able to wrap cans of a certain shoe polish in tissue quicker than any other girl had ever been able to perform the operation. The time study man suggested that she eliminate one quick motion. It was unnecessary. So she did, and incidently increased her output one-third.

Now you are not making biscuits, paint, or shoe polish, but you are producing something. Take a look into the situation if your profits are not what they should be. Weed out the extra motions, the expenditures of effort and material which do not lead to direct results. Perhaps a bit of machinery will help, as it has in many other instances easy to recall. No man can say that he is perfect or that he is doing anything in the most perfect, economical and efficient manner in which it can be done. Every imperfection, unnecessary expense or mark of inefficiency which is removed means that your books will show an increased amount on the side you like to see grow. Throw the searchlight into your own processes, and you may be able to discover some little thing or the use for some machine which will save you money. Remember that the amount of money invested is not the most important thing—it's the rate of income on that money which really counts.

Concrete Giants

Although the installed capacity of the hydro-electric plants of the eight leading countries of the world is now about twenty million horsepower, at the present rate of increase this total will be doubled by 1930, according to Benjamin E. Jones, hydraulic engineer of the United States Geological Survey. Twenty million horsepower in a day in which it cannot yet be said that the flour mill at the side of the "Old Mill Stream", the only use formerly made of nature's prodigious water power, is a thing of the past!

Putting nature's forces to work is every day becoming a more advisable adventure. Coal cannot last forever, and neither can oil. As these commodities become scarce, their prices mount, making expensive installations of water-power equipment and perhaps even, in the future, sun power equipment, profitable. But, be that as it may, only the most skeptical will doubt the assertion that hydro-electric power, although now used to the extent of twenty million horsepower, is yet in its infancy. Its more universal application is a thing most of us will probably live to see.

Regardless, however, of the probable rate of growth of the enterprise, it is gratifying to note that even in its present status, hydro-electric development is a lasting monument to the utility of concrete—concrete, the massive giant which stems the flow of mighty rivers, pushing back relentlessly and untiringly against the liquid surge. Concrete alone has made those vast engineering undertakings possible and concrete alone has served to give them lasting qualities. Long after the designers have passed, their concrete marvels will still be holding back the waters which make cheap power possible!

Black Diamonds

Coal is a commodity which is only too often slighted even by the astute business man. Buying fuel as you use it is all right in theory, but buying it and getting cars to deliver it are again two entirely different things. Crops have to move at the same time that coal should move. What happens? Crops are delivered while fuel waits. But that isn't the only consideration to take into account. The coal mining industry has been subjected to more labor difficulties and to more uncertainties than any other vital industry. When the situation is clear and the black nuggets are plentiful, a great many executives are prone to buy fuel as they need it. Then the cloud comes up, the bin is empty, the executive worries, and industry lags because it has nothing with which to turn the wheels.

Lack of coal causes a business interruption, and there never was an interruption that did not cost money and lots of it. Loss of money on the part of capital means further loss on the part of labor—a sort of shifting of the burden as it were. When labor lacks money all business slacks, and we have a minor depression. And all of this is caused by the fact that, although some men consider it wise to lay in the residential winter's supply of coal early, they fail to apply that same principle to industry.

Shall the State Operate Cement Plants?
V

Operation means management, and management has always demanded experience if it is to be successful. It is true that experience will not always fit a man for management, but it is just as true that the man who is successful in management must have experience added to his innate ability before he can successfully manage. This is true because to manage means to execute, and to carry out policies and programs demands not only a knowledge of the particular business under consideration but also experience which includes a knowledge of how certain policies and programs have turned out in the past.

Granted the above, it seems clear on the face of it that with a government that frequently changes hands every four years, and always changes hands every eight, we have a condition which is not inducive to effective operation of private business. For where, in four years, can a group of men gain that particular experience which must underly the successful operation of any given industry, whether it be cement, coal, or railroads? As the saying goes, it isn't being done, this year or next year, or any year.

The answer to this position may be that, however frequently our governments change hands, the probability is that each administration would place those private industries they operate into the hands of experienced men, so that the conduct of the industry would be stabilized and successful. Experience has shown however that wherever the government goes politics follow more surely than the flag, and politics have ever been more interested in promises and votes than in results. The work of industry is accomplished in the shadow and quiet of hard toil; the work of politics must be done in the glare of the spotlight and the rumble of the band; the work of industry is concrete and detailed: the work of politics deals in generalities and pledges, not in performance.

When the government attempts to separate the operation of affairs from politics, it must of necessity do as it has done and institute the civil service. Now, for governmental functions it is probable that the civil service examination as a means of selecting candidates for positions is the best method yet devised, but that the results are far from satisfactory is known to the governmental executives and the public in general. A man who passes the civil service examination practically has landed a job for life: he is robbed of the necessity of holding that job by efficiency and consequently relapses into an automaton. And the world's work is not being done by automatons.

In an article appearing in *Collier's* recently, an interview with Henry Ford regarding the possibility of his being elected president of the United States, emphasized the great difference between government operation of business details and the manner in which the same is accomplished in private industry. Henry Ford was quoted as saying that if he were President he could not operate the government as he does his factory at present: that he could not discharge this man or that if they were not getting results in the way he does today at Detroit. Had the government taken over the Ford plant in its infancy, do you suppose our highways and byways would be cluttered up with cars bearing his name as at present?

But even here, the civil service stops in a hurry. It never reaches the executive; it deals only with the clerks and stenographers, with the men and women who have nothing to say about policies and programs. Every new administration means a new set of executives in every governmental department: a new official cabinet, a new postmaster in every important postoffice, a new head of the shipping board, etc. The experience of the men who have been holding the job and learning its ins and outs is thrown into the discard, and a new man, who must get that experience anew, is put on the job, only to be thrown out again at the time he is most fitted to handle it.

More and more industry is recognizing the high cost of turn over, whether it be in the realm of clerks and stenographers or in that of the guiding spirits of the business. Can you conceive of the United States Steel Corporation replacing E. H. Gary at the end of four years, and then every four years placing a successor on the job? Or the Illinois Central disposing of C. H. Markham and of his successors regularly every few years?

But suppose we look at the government as a board of directors which, if it operated a private industry such as cement, would act toward it as does a board of directors of a private corporation. Let us consider how such a governmental board would be selected as contrasted with the board of directors in a private concern. In the latter case the board is made up of investors—investors of considerable capital who have much at stake in the prosperity of the business. In the latter, the board is made up of persons elected by vote of the electorate, whose object is to keep on the job and who, if they are to keep on the job, must be responsive at least at election time to popular opinion. Now, the millions of voters in these United States cannot and do not, have intimate knowledge of business affairs, and their emotions rather than their reason are their guiding force. The majority of voters are clerks and subordinates without experience in executive work. Their cry is and always will be for cheaper costs; they have no knowledge of what goes to make up costs and what is involved in production of commodities.

Then the personnel of the board of directors is another matter of concern. Picked by vote from a wide range of private experience, our legislatures are, economically speaking, a conglomeration of experiences: some of the men in them, to be true, have a wide acquaintance with business affairs but others are woefully limited in that experience and can be credited with only a small success in private life. To intrust to their judgment the conduct of an industry such as the manufacture of cement for public use, involving as it would the handling of millions of dollars, would be as wise as to trust a child with its own diet. It would be fair neither to the invested millions or to the men themselves.

We must not forget that, after all, the business of the country is, in reality, of greater importance than the government of the country. True, wihout government, chaos would probably rule, with the result that business could not be carried on; but without business, which is protective and furnishes the necessities of life, no country can exist. Consequently it is of prime importance that business protect itself against all force, governmental or otherwise, which tends to decrease its efficiency. It is high time that American business recognize this fundamental principle of economics and exert every effort to defend itself and the common weal.

If experience in the management of business has any value; if the concern that goes with invested dollars is conducive to efficiency, then surely the welfare of private business demands that the inexperienced touch of government be kept removed from our cement industry.

Do Your Profits From Cement Drip Away?

A Discussion of Correct Lubrication at Minimum Cost Showing How Careful Consideration of the Proper Oil for Each Purpose Helps to Swell Dividends

Those familiar with the conditions existing in cement mills know too well the difficulties surrounding the lubrication of the wide variety of machines employed. High and low speeds, light and heavy loads, extreme heat and winter exposure are variations of conditions that complicate the problem; but the greatest difficulties encountered result from the combination of these conditions with the fine, penetrating, abrasive dust that is everywhere present in and about the cement mill. The liberal use of grease and oil have not shown complete protection against wear and many operators replace the worn out parts and charge the cost to the maintenance account. This expense is thus regarded unavoidable. The incident losses due to extra power cost, and the stoppage of production every time a machine is shut down for repairs become a matter of course, that rarely receives serious attention.

If these losses were unavoidable, there would be no reason for discussing the subject. As a matter of fact, however, experience has demonstrated that power can be saved, repairs to bearing parts greatly reduced, and operation made more reliable and continuous—all this at less cost for lubricants and labor than is common practice.

Correct Lubrication and Profits

Let us consider the influence of correct lubrication upon the profits of cement mill operation. It is well known that correct lubrication of machinery is highly profitable in any industry. Where conditions are unusually difficult, a solution of the problem brings proportionately greater returns. It is worth while to see what pages of the cement mill ledger will be influenced by correct lubrication. The chart, Fig. 1, shows the main line of reasoning in this regard, and will be easily understood. Correct lubrication in general is accomplished by the use of the right oil, applied to the right place in the right way. All three of these essentials to correct lubrication must be considered in relation to the machine and the conditions of operation.

The right oil for one service is not necessarily the right oil for another. Oil selection is a special problem, that will be explained later in a general way. The benefits resulting from the use of the right oil for each service are so great that the cost of oil per gallon is of minor importance, especially when it is considered that the use of a rich lubricant accomplishes its purpose on comparatively small oil consumption.

In cement mill work, the one condition that is common to all bearings is the presence of excessive quantities of dust and grit. This fact renders the methods of oil application and distribution of special importance.

Oil application must be so accomplished that the oil enters the bearing in a clean condition, at a constant uniform rate, and, for the sake of economy and cleanliness, it should be supplied in just the quantity needed. The distribution of the oil within the bearing should insure its gradual flow toward the ends of the bearing, and should never permit oil which has been contaminated to pass back between the bearing surfaces. The methods by which these results may be accomplished will be explained in later paragraphs.

The direct results of correct lubrication are—reduced frictional loss of power, lowered consumption of lubricants, least possible wear of parts and the reliable, continuous operation of the plant. The reduction of friction to a minimum at all times assists in speed control. Automatic means of oil application, requiring little attention, tend toward less labor of attendance. The fact that lubricants are not wasted results in clean floors and less oil damage to the product, less danger of slippage and accidents among the working personnel, and less fire risk.

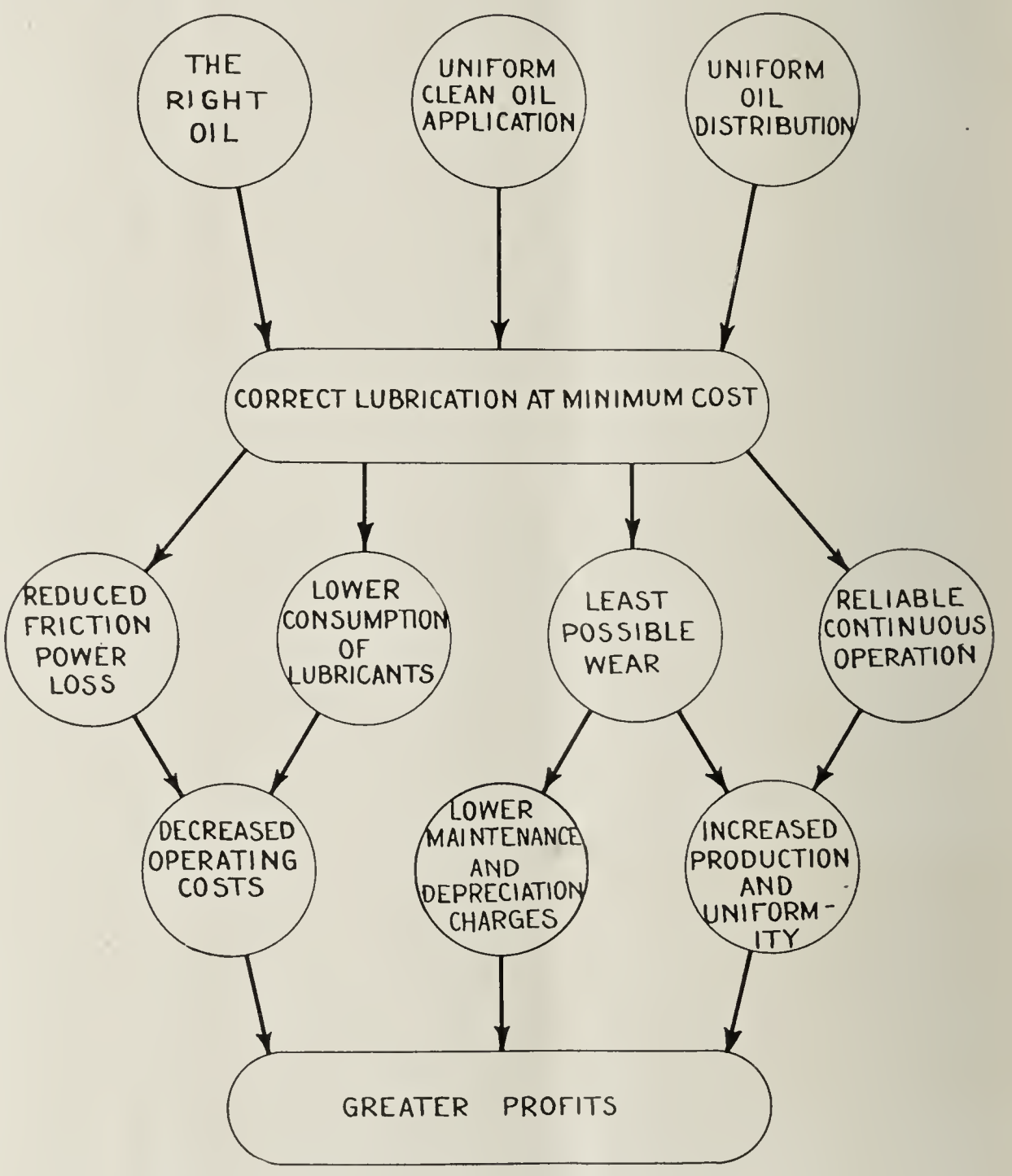


Figure 1. A graphic way of expressing oil common sense.

Turning now to the accounts of the company, as they appear on the ledger, the results of correct lubrication are as follows:

1. Decreased operating costs, i. e. reduced power costs, lower monthly cost of lubricants, due to their greater efficiency, and less labor of attendance due to the use of automatic appliances.

2. Lower maintenance and depreciation charges, because of the decreased wear of parts, saving on repair bills for parts and labor costs for replacement and increasing the useful life of the equipment.

3. Increased production, due to improved reliability and greater continuity of operation, as well as better speed control.

These factors also tend toward greater uniformity of the product. Bearings kept in better condition also tend toward the correct operation of machines and therefore better product.

All of these effects tend toward the same result, which, after all, is the ultimate aim of an industry, greater and more certain profits.

Methods of Oil Application

There are only a few ways in which oil can be applied satisfactorily under the adverse conditions prevailing in cement mills. Hand application is to be

most strongly condemned, because it is extremely wasteful, unreliable, can not be made uniform, requires much labor and, most important of all, the oil so applied is unavoidably charged with grit which defeats the purpose of lubrication. The common type of sight feed oil cups are nearly as bad, because they can not be kept clean and are easily clogged with grit.

The bottle oiler is especially adapted to the economical, clean application of oil to all the smaller bearings of cement mill machinery. The device is illustrated

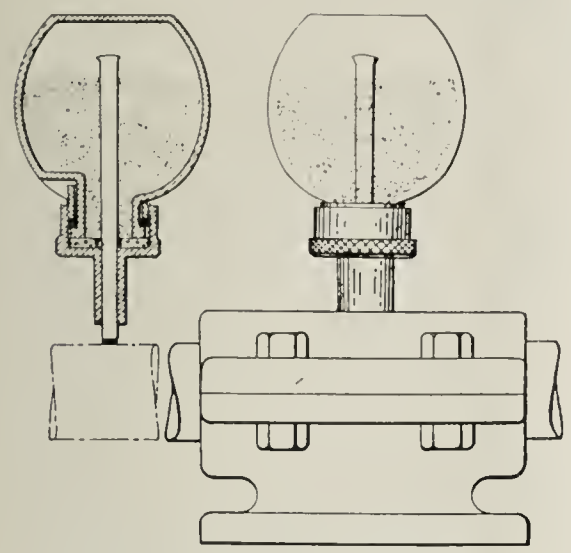


Figure 2. A bottle oiler.

in Fig. 2, both separately and mounted on a bearing. These bottles are filled in the oil house with the oil correct for the purpose, and a few are carried by the oiler in a small basket to replace those that are found nearly empty. As indicated in the illustration, each bottle oiler is mounted on the bearing in such a way that the loose steel spindle of the oiler rests by its weight on the journal. The slight vibration given to this spindle when the shaft is in operation causes the oil to be fed downward from the bottle at a very slow but dependable rate. When the machine stops, oil ceases to flow. A loosely fitted journal receives more oil than one closely fitted due to its greater vibration. Although this type of oiler is especially adapted to small bearings, its advantageous features are so great that large bearings

Figure 3. A group of bottle oilers.

are often fitted with them, the greater feed of oil being secured by the application of from two to six bottle oilers, dependent on the bearing requirements.

Bottle oilers may be mounted in a short quarter inch pipe nipple, screwed into the bearing cover, or, if the bearing is made with a grease recess, this may be filled with babbitt, or a tight fitting block of wood, drilled with a hole to fit the shank of the bottle oiler. In larger bearings, where the cap is over 7/8 inch thick, it is only necessary to drill a hole in the bearing cap to receive the shank. In Fig. 3 can be seen a group of bottle oilers as applied to a coal feeding mechanism.

In economy, bottle oilers are superior to all other devices. They also deliver the oil to the journal in clean condition, whatever may be the surroundings. They are labor savers, because the oil is visible, and can be observed from a distance, and because they require filling only at long intervals—from a week to a month, depending on the amount of vibration. The only limitations to the use of bottle oilers are the restricted feed, which is too small for large, heavily loaded bearings, and the requirement that the shaft must be horizontal.

Wick feed cups and specially designed wick feed oilers of sizes as required are adapted to the application of oil to large bearings demanding more copious lubrication, and those whose position does not permit the use of bottle oilers. A wick feed cup is illustrated by the sec-

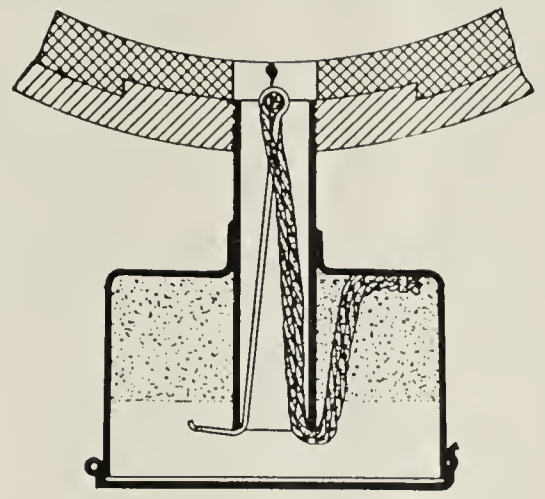


Figure 4. A wick feed cup.

tional view, Fig. 4. This device consists of a covered oil container, and a tube through which a wick leads from the oil to a point an inch or two below the bottom of the cup. A wire wick holder is employed to insure that the wick will take its correct position, so that it may act as a syphon.

The rate of feed may be increased or decreased by changing the number of strands in the wick. A wool yarn of good quality should be used. Uniform feed can be secured from a wick feed oiler only by keeping the oil lever nearly constant. For this reason a wide shallow container is better than a narrow deep one. For use in the cement mill, wick feed oilers are especially valuable, because of the fact that the oil passes through the wick, and is thereby filtered just before it reaches the bearing surfaces. Even if the oil in the cup is contaminated with cement dust, it will be thoroughly cleaned before it enters the bearing. Such contamination is objectionable, however, because it tends to clog the wick in the course of time, and should be avoided by means of a tight cover.

Both bottle and wick feed oilers should be used only with oils of high quality, because inferior oils quickly form gummy deposits and interfere with the automatic working of the oilers. This would tend to make the bottle oiler spindle stick and to clog up the wick of the wick feed oiler, in either case stopping the oil feed and endangering the bearing.

Grease lubrication, which is the general rule in cement mill machinery, has two great disadvantages. First, a grease will not flow and form a lubricating film until it has been heated, and generally this heat must be caused by friction which may cause wear. Thus the relief is given only after the evil has occurred. Second, grease is highly viscous, and results in fluid friction far in excess of that experienced with a correct oil. For these reasons and other minor reasons, grease should not be employed except when the conditions make the use of oil impractical. For example, the oiling devices already described can not be used on eccentrics and certain other rapidly moving parts. In such cases, grease cups must be used. These require frequent attention to screw them down.

Oil Distribution in Bearings

In a correctly lubricated bearing there is no actual metallic contact with the journal, because a thin oil film fills the clearance space and completely separates the parts. This oil film is under pressure on the side that takes the load, and is constantly replenished and built up by the wedging and carrying action resulting from the form of the bearing surface and the motion of the journal. Badly worn bearings are often in a condition that makes lubrication nearly impossible. When steps are taken to introduce correct lubrication, it is best to go over the bearings and get them into good condition, so that the maximum benefits may be secured. Once in good condition and correctly lubricated, the equipment will give far better service and can be kept in prime condition with a great reduction of repairs.

Grooving bearings to insure oil distribution if properly done is sometimes beneficial. In cement mill machinery special care is necessary to make sure that oil, once reaching the bearing ends, is not brought back into the bearing through grooves, because it will carry grit from the surrounding atmosphere with it. Most of the common methods of bearing grooving would cause this trouble. It is generally best to have no grooves, but to cut a chamfer or slight bevel on the edges of the two bearing parts, stopping the cut about half an inch before the ends are reached. This chamfer acts as an oil reservoir and the motion of the journal assists the oil to form a wedge; the scraping action that a sharp bearing edge would create is thus avoided.

The Oil for Cement Mill Equipment

This subject has been left until the last because it can scarcely be discussed until the questions of application and distribution are understood. It must not be hoped that an article of this scope will contain a complete analysis of this broad subject. Only the major factors can be discussed.

The chart shown in Fig. 5 is intended to assist the reader in visualizing the problem of oil selection. High quality oils, whatever their purpose, should be of high purity, and should be uniform, so that after an oil has been found to meet the need, equally good results can be secured from subsequent purchase of the same brand. Stability of the oil is essential, and is that characteristic which prevents it from undergoing change of any sort when subjected to unavoidable contamination or after undergoing pressure or heat.

High lubricating value of the oil is difficult to define, but of supreme importance in order to accomplish correct lubrication. It is this feature that makes it possible for a few drops of one oil to do the work of a pint of another oil. When a journal stops, its weight tends to squeeze out the oil film after a time.

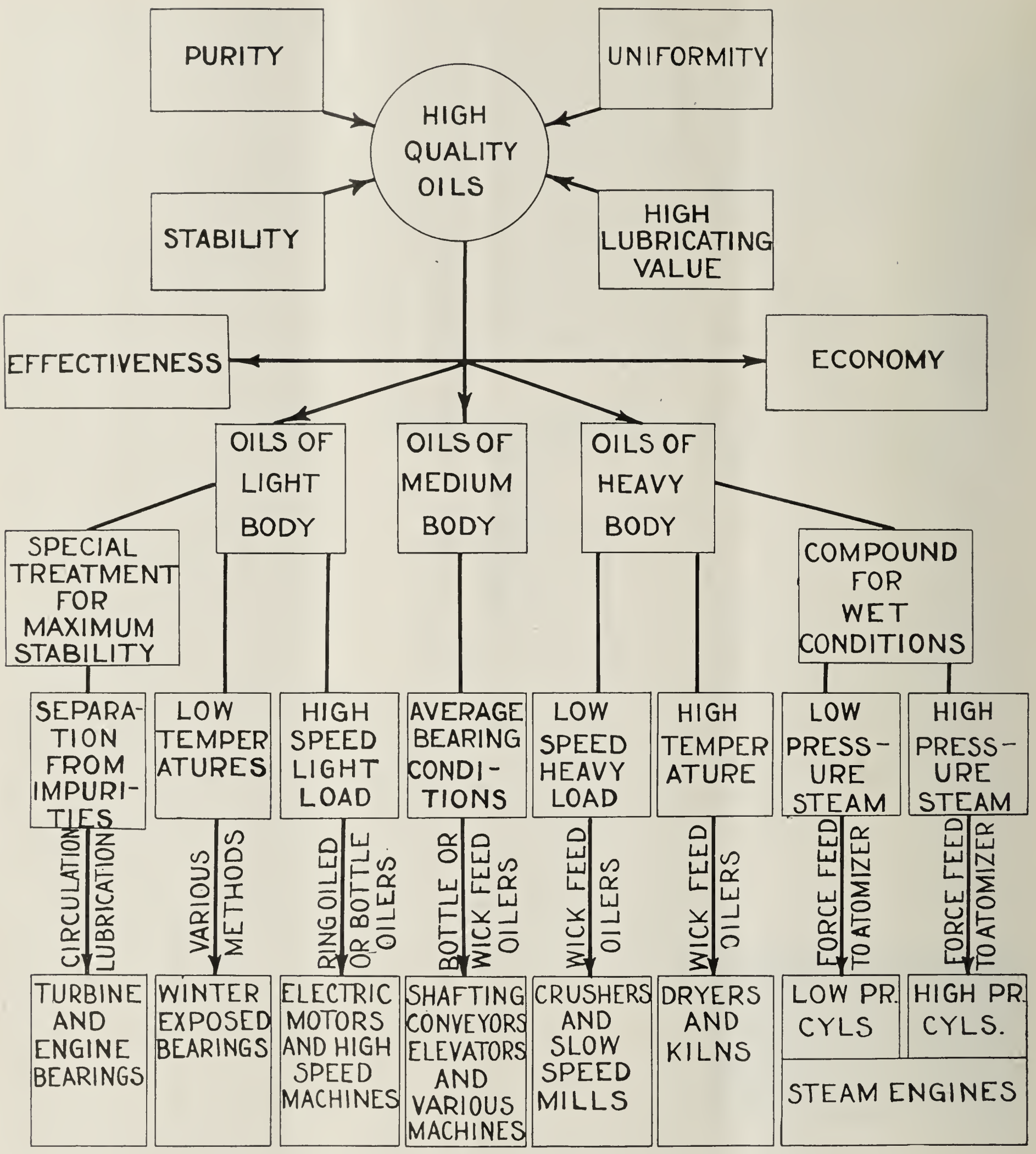


Figure 5. This chart will help you visualize your problem of oil selection.

When starting up, until the oil film is again built up, the metal surfaces will rub. An oil of high lubricating value still protects the surfaces under this condition, while one of low value results in scored surfaces. The same is true during operation, the better lubricant clinging more strongly to the surfaces and maintaining a tough oil film that will not puncture and permit wear.

Effective and economical lubrication is the result secured when an oil of high lubricating value is properly selected for the specific service.

Oil body should be thought of as the pressure-resisting properties of the oil film, rather than the viscosity alone. Although the possible gradations in oil body are infinite in number, it is sufficient for our present purpose to classify oils broadly as those of light body, medium body and heavy body, with the understanding that each of these divisions represents a group with many sub-divisions.

Oils of light body are advantageous when the speed is high and the load light, since high speed assists in building a strong oil film and light load decreases the tendency to penetrate the film. A high grade oil of light body will possess low viscosity and therefore its use will result in a minimum amount of fluid friction. Electric motors and various high speed machines require this type of oil which should be applied by means of bottle oilers, unless the bearings are made of the automatic ring oiling type.

The bearings of direct connected steam turbines and of steam engines, provided with a circulation system of lubrication, require a light bodied oil

which will separate readily from impurities, and having the highest possible degree of stability, because this oil is to be used over and over again, and must not lose its value through use or through the chemical action of impurities gathered from the system. Such an oil can be produced only by special care in the selection of the crude and by the most complete and scientific treatment in manufacture.

For bearings exposed to winter conditions, an oil should be used that will maintain its fluidity at a low temperature. Oils of this class are generally of light body at ordinary room temperature, but become heavier, as do all oils, with a decrease in temperature. Special care in the selection of crude and method of manufacture is necessary to produce an oil of this character which will still retain stability and high lubricating value. Oils of medium body meet the great number of average bearing conditions and are generally best applied by means of bottle oilers or wick feed oilers to the bearings of line shafting, elevators and a wide variety of machines.

The circulation systems of geared turbines and large enclosed reduction gears call for an oil of medium body, which has undergone special treatment similar to that described for the circulation system of direct connected steam turbines and steam engine bearings. An oil of this character is demanded also for the lubrication of the air cylinders of air compressors and blowers. Oils of heavy body are required in order to establish an oil film of sufficient strength to support heavy loads, especially when combined with low speeds. The bearings of crushers and slow speed mills and also some of the larger line shafting come within this group. Wick feed oilers are generally best adapted to this service.

The various types of dryers and kilns, due to the prevailing high temperatures, require the use of oils of heavy body for bearing lubrication. Even where the bearing pressures are not high, a heavy bodied oil is necessary because of the thinning effect of the high temperature. Here also wick feed oilers should be used.

The cylinder lubrication of steam engines demands oils of still heavier body than those just mentioned. The presence of moisture in the steam cylinder demands that the oil be compounded in such a way as to enable it to adhere to wet surfaces. Although the hydrostatic lubricator is commonly used, far better results in terms of certainty and economy can be secured by the use of mechanical force feed lubricators. In general, the best place to apply the oil is through an atomizer into the steam pipe, a few feet back of the throttle, making sure that there are no bends or traps in the line between the atomizer and the cylinder that might cause the oil to separate from the steam.

In cross-compound engines where there is a receiver between the high and low pressure cylinder, it is generally necessary to use a lighter bodied oil for the low pressure cylinder, than for the high, because an oil selected for high temperature and high pressure conditions would be too heavy to easily atomize and spread with economy in the low pressure cylinder.

This brief outline only skims the surface of the problem of oil selection. Even if this were expanded and made far more complete, it would still be impossible to equip the reader with all the knowledge necessary for the selection of the brands of oil which would correctly fit all needs of the cement mill. Broad field experience and knowledge of the service value of the oils are needed. Even small variations of conditions may require changes in the lubricants. Special problems of application arise. The number of lubricants must be kept as small as possible. All these facts demand the service of a lubrication specialist.

The manufacturer interested in the production of lubricating oil, in the interest of correct lubrication maintains a large staff of engineers. Through their efforts service is rendered to consumers through the study of the mechanical conditions, the selection of lubricants, and the adoption of application methods that will give most advantageous results. A systematic follow-up system assures the continuance of the benefits of correct lubrication thus installed.

Electric Motor Lubrication

The common use of electric motors in cement mills together with the fact that their failure frequently means the loss of production of an entire department, renders their correct lubrication a matter of special importance. Ring oiled bearings, which are almost universally used on electric motors, are very efficient from the standpoint of lubrication, provided the proper quantity of the correct oil is kept in the bearing, and provided this oil is kept free from impurities. Electric motor bearings are frequently fitted with felt packing rings to prevent the loss of oil and the entrance of impurities. Under the extremely difficult conditions encountered in cement mills, however, this precaution is not sufficient to keep impurities out of the bearings permanently. For this reason these bearings should be drained of oil at regular intervals and refilled with fresh oil. When the correct oil is used, that withdrawn from the bearing may be filtered and re-used.

Oil Storage and Handling

The importance of clean oil in the bearings has already been mentioned. A system of oil storage and handling that does not keep the oils in perfectly clean condition until they are used, is a positive menace to the plant. All lubricants should be kept in a special oil house under the care of an intelligent attendant who understands their uses. This oil house should be fitted with closed tanks into which the oil barrels may be emptied and from which the oils may be drawn as required. Special pumps manufactured for measuring out oil from the tanks are very advantageous.

Grease barrels should be placed on one side, removing only the upper section of one head. As the grease is used, additional sections of the head can be removed. A piece of canvas should be thrown over the barrel in such a way that it will hang over the end to keep out dust. These precautions keep the grease in a clean condition.

Attention should also be given to the type of containers used in handling the oil and transferring it to the various places where it is to be used. These containers should be covered. Care on the part of the oil house attendant is essential to avoid mixing the various lubricants and especially to see that the containers are clean and free from adhering oil of a kind that might contaminate the oil that is to be distributed.

Lubrication Engineering Service

Correct lubrication is a science, which becomes more and more complicated as the conditions encountered become more difficult. Although the general principles may be stated in a fairly simple way, their application and adaption to the conditions of practice becomes extremely complex, and demands broad experience and expert knowledge. For this reason, the oil manufacturer whose primary interest is the production of correct lubricants maintains a large field staff of lubrication engineers. Through their efforts service is rendered to consumers through the study of the mechanical conditions, the selection of lubricants, and the adoption of application methods that will give most advantageous results. A systematic follow-up system assures the continuance of the benefits of correct lubrication thus installed.

A fireproof garage built of pre-cast concrete slabs. The entire structure was prepared before erection. The slabs being inserted into the concrete uprights and the whole finished with a concrete slab roof.

Measurement of Concrete Consistency

Engineers are of course familiar with the water-cement ratio theory of the strength of concrete and with the fact that one pint more mixing water than necessary in a one bag batch reduces the strength as much as if two or three pounds of cement had been left out. While it is seldom possible to use a mix sufficiently dry to attain maximum strength, every effort should be made to approach that goal. Few people realize that twenty-five per cent more mixing water than necessary to attain maximum strength will reduce the strength of concrete fifty per cent. Unfortunately so much excess mixing water is sometimes used that the concrete attains only a small fraction of its potential strength. Such concrete never attains the strength and durability necessary for permanence. Excess mixing water is the most frequent cause of unsatisfactory cement.

Mixing water has two functions in concrete: first to hydrate the cement, and second to produce a workable consistency. As applied to concrete work Prof. Abrams of the Lewis Institute defines consistency as "The relative plasticity or workability of freshly mixed materials." By far the larger part of the mixing water, even when it is limited to the amount giving maximum strength, is required for the second function—to produce a workable consistency. The larger the volume of aggregate in proportion to the volume of cement (i. e., the leaner the mix), the greater the quantity of water needed to produce a workable consistency, and the weaker the concrete.

The quantity of mixing water required in concrete depends on seven factors: the consistency needed in the work, the normal consistency of the cement, the size and grading of the aggregate, the mix, the absorption of the aggregate, and the time of mixing. As all of these factors cannot be determined in advance, definite quantities of mixing water can rarely be specified, but it is desirable to limit the quantity, and to regulate it as closely as possible. This can best be done by selecting a consistency suitable for the work in hand, and then taking steps to secure that consistency uniformly throughout the work. The consistencies recommended in the Progress Report of the Joint Committee can be taken as a guide.

For these reasons, and because of its importance in handling and placing concrete, consistency is a vital factor in concrete work. Slight variations in consistency may nullify important changes in other variables such as the quantity of cement or the grading of aggregates. Therefore accurate and easily used methods of measuring consistency are important. Several methods have been suggested by various investigators, among them being the following:

1. Penetration of a metal rod.
2. Measurement of angle of repose.
3. Rate of flow down chutes.
4. Flow through orifices.
5. Slump test.
6. Flow test.

The first method was doubtless suggested by the Vicat needle that has long been used to determine the normal consistency of portland cement and which is one of the tests required in the Standard Specifications for Portland Cement. This method gives excellent results with cement pastes but in general the attempts to use it in concrete mixes have been unsatisfactory. The Bureau of Standards is now experimenting with this method in combination with the flow table (described below), the indications pointing to valuable results.

Measurement of the angle of repose has been tried but has not been satisfactory, because it is affected by several variable factors, such as the size and location of the aggregate.

Many attempts have been made to measure the consistency of concrete by means of its rate of flow down chutes but a satisfactory method has not been developed. Slight variations in the material of which the chutes are made, in their smoothness, etc., materially affect the results.

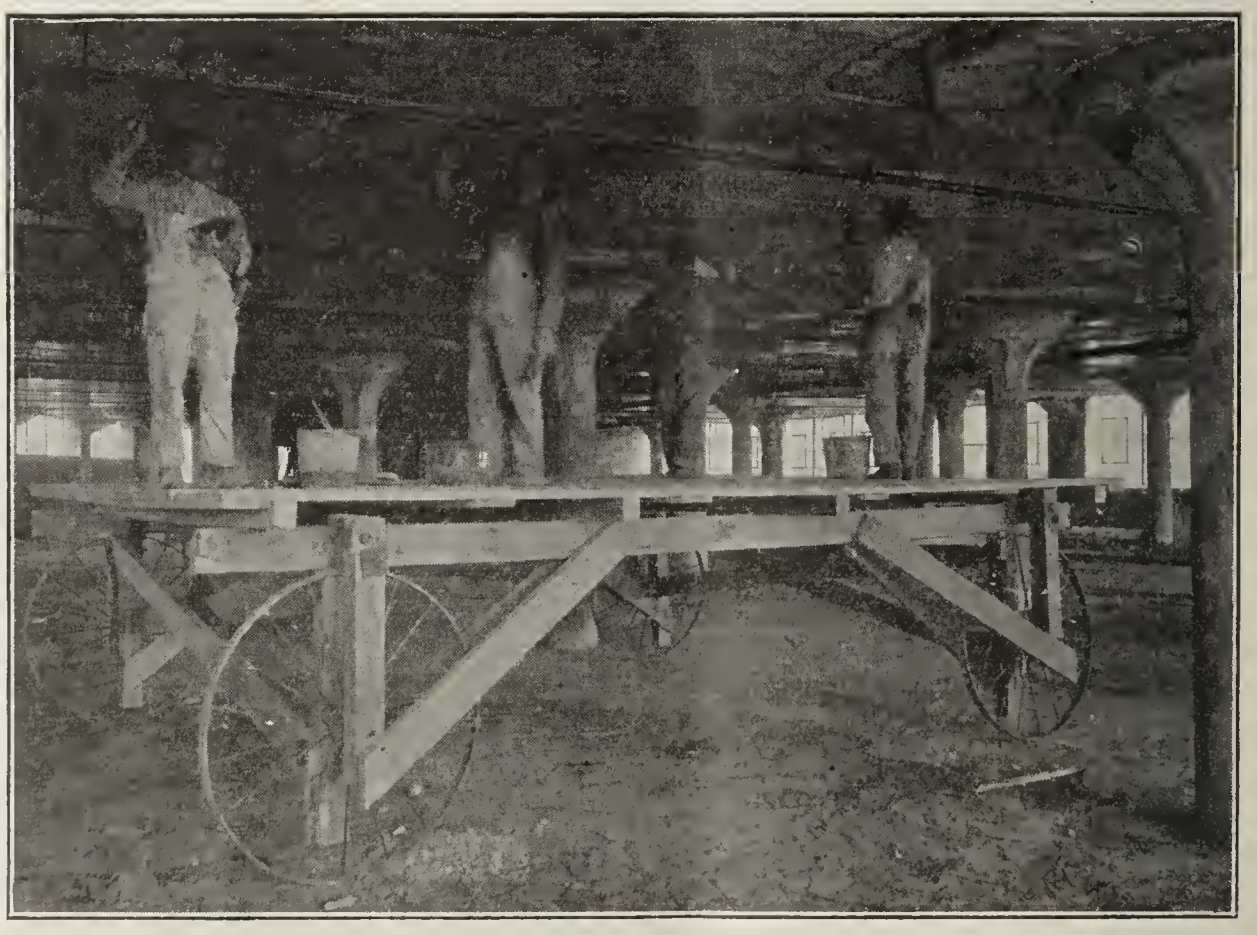
Quantities of water being frequently measured with accuracy by flow through orifices, it is natural to attempt to measure the consistency of concrete in the same manner, but the presence of the aggregate prevents satisfactory results.

The slump test is free from most of the objections found in those methods and gives fairly uniform results. Furthermore, the test is simple and easily understood and the equipment is cheap and easily made. A metal form, shaped like a frustrum of a cone, 4 inches in diameter at the top, 8 inches at the bottom, and 12 inches high, is filled with the concrete to be tested. The form is immediately lifted off and the settlement or "slump" of the concrete is measured. The amount of slump indicates the consistency. A 6 by 12-inch cylinder was first used for this test, but the cone-shaped form has been found better. Although slump tests are not precise, they are sufficiently reliable for most work, and are coming into fairly general use.

The flow table has been developed by the Bureau of Standards for measuring the consistency of concrete. The apparatus consists of a metal form and a special table so attached to its frame that it can be rapidly raised and dropped one-half inch by means of a cam. The metal form, as in the slump test, is shaped like a frustrum of a cone, but is wider and shallower, being 6¾ inches in diameter at the top and 10 inches at the bottom, but only 5 inches high. This form is placed on the special table and filled with the concrete to be tested. The form is immediately removed and the table rapidly raised and dropped fifteen times in about ten seconds, causing the mass of concrete to spread out. Its base diameter is then measured. The ratio of this base diameter to the original diameter (10 inches) expressed as a percentage indicates the "flow" of the concrete. Obviously the wetter the consistency the greater will be the flow.

As the flow table gives more accurate and more uniform results than the slump test, it is generally used in laboratory studies. The additional equipment required (a specially built table) is sometimes considered an objection to its use in the field.

The Orton & Steinbrenner Company, of 608 S. Dearborn St., Chicago, announces the addition of J. J. Murphy to its Chicago sales force. Mr. Murphy formerly was the Chicago representative for the Browning Engineering Company, of Cleveland.



A movable platform large enough to accommodate four workmen is being used to excellent advantage on big jobs by the Aberthaw Construction Company, Boston. One of the foremen saw the great possibilities in rigging up such a platform so that the men would be within easy reach of their work and not be required from time to time to get down and move their platform. The workmen can move these platforms simply by shoving with their hands against the ceiling.

Simplicity of construction is another feature that recommends these platforms. One such platform was built of joists formerly used for form lumber; the top was made of floor form panels. Wheels that were borrowed from concrete buggies were supported on old form bolts driven through the platform posts. If the floor is uneven, it may be necessary to block the wheels to steady the platform.

Your Coal Pile

(Continued from page 20)

tity of a certain excellent grade of fine coal at $1.50 per ton, or even less, at the mine. Four weeks later an inquiry for 200 carloads was met with a refusal to place so large an order at less than $1.85. On the 200 cars, or 10,000 tons, this represents an actual increase in cost of $3,500, in less than one month of expired time. From another district where fine coal was available on August 1, at 90 cents per ton, producers refused, four weeks later, to name a price more than twenty-four hours ahead.

Like all the tales in McGuffey's old "Sixth Reader," this story is possessed of a moral—one so obvious as hardly to need to be drawn for the intelligent reader. Knowing the market for his product and the price which he will obtain for it, any manufacturer knows what he can consider a reasonable price for coal. Whenever, during the summer months, coal can be obtained at or below that figure, his order should be placed for enough to fill a large portion of his requirements during the coming season. If he is possessed of the spirit of gambling or bargain hunting he can leave an opening of from ten to thirty per cent, in his total requirements, and get plenty of excitement and mental gymnastics in attempting to fill that hole with the bargain coal which may show up from time to time.

The man or manufactory that gets caught short of coal during the coming winter will have to look for sympathy in the dictionary—he will find it in no other place. Coal has been cheap for many months. The figures of 90 cents and $1.50, mentioned in a preceding paragraph, were each below the cost of production for the coals on which they were quoted. Ordinary business judgment should have moved any consumer to buy at those figures. As winter approaches and advances both demand and consumption increase. It is inevitable that any change be upward. Considering which, it is hard to conceive why industrial stocks are low today, as they are.

To sum up, it can be safely said that a strike or other form of interruption to production in the anthracite producing fields can have little or no effect on coal for cement. Other factors, however, clearly indicate that if the winter storage pile is not yet completed, every additional day of delay is going to mean additional cents on every ton that has to be buried during the winter months to come.

Installing Mammoth Concrete Sewer Pipe

Reinforced concrete sewer pipe of large diameter is tardily, although none the less surely, coming into its own in American cities. At present, extensive installations are being made in New York City, Jacksonville, Fla., New Orleans, La., Columbus, Milwaukee, Kansas City, Denver and practically all of the larger cities on the Pacific Coast.

The accompanying view shows some of the large concrete pipe being installed in the new sewer system of Hammond, Indiana. More than forty thousand feet or seven and one-half miles of concrete pipe is being laid. The largest pipe is 108 inches in inside diameter and each 5-foot length weighs nine tons. These pipe are cast on a location as convenient as possible to the point of installation and transported on heavy trucks or rolled on the ground or pavement by large tractors. They are lifted and lowered into position by large cranes. Over fifty-two and one-half miles of similar pipe is now being installed in the new aqueduct system for the city of Tulsa, Okla.

Reinforced concrete pipe is designed to sustain enormous loads and is preferred by those acquainted with its use because of exceedingly smooth interior, speeding the flow of water or sewage. The rapidity with which concrete pipe sewers and water supply lines can be laid is a great convenience in the larger cities where it is possible to open the street just ahead of the pipe layers and refill the excavation almost immediately after the pipe is in place.

"Say It With Cement"

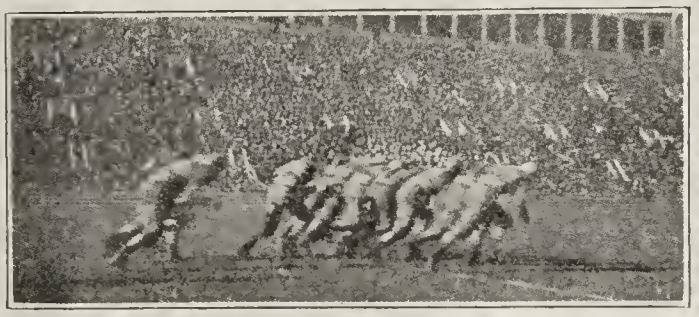
The clever plagiarism of an already popular slogan to further an unrelated project successfully is illustrated by the changing of "Say It With Flowers" to "Say It With Cement," on the occasion of the recent concrete stadium drive of Centre College, Danville, Ky., famous for its almost invincible football teams. It will be remembered that "Bo" McMillan and "Red" Roberts, with a handful of stars, journeyed from their little Kentucky college to Harvard about two years ago and succeeded in surprising sport fans by defeating the famed eastern team six to nothing.

Success in football led the alumni to attempt the erection of a new arena for its stars. It was then that some ingenious grad conceived the "Say It With Cement" idea. Since then money in multiples of $3.15, the price of a barrel, has been rolling in, so that the project will be completed in time for the fall games. Contributions covered a wide range. School children gathered in pennies and nickels so as not to let the older people's hundreds claim all of the glory. One inmate of the state penitentiary, although recalling the fact that he had a wife and four children to support, sent in his donation of $3.15, with the hopes that his meagre barrel might add to "the glory of Centre." It evidently did, for stadium is rapidly nearing completion at the present time.

WHO ARE THESE BOYS?

"ASK HARVARD"

—SHE KNOWS



THIS TEAM BEAT HARVARD 6 TO 0, OCTOBER 28, 1921

$3.15

A BARREL

"SAY IT WITH CEMENT"

HELP THE COLLEGE BUILD THE STADIUM

That Put THE SOUTH on the Map in Athletics

NAME OF DONOR	CITY	STATE	NO OF BBLS.	TOTAL AMOUNT

A recent photograph of Chicago's great stadium in the process of erection.

Chicago's Great Memorial Stadium

One of the Largest Cast Stone Projects in History Will Give the Western Metropolis an Ideal Amusement Center

By Earle W. Manthey

Deviating a little from the original plans by constructing two sides of what is, in the future, to be a "U" shaped stadium, Chicago still has, in the structure now being built in Grant Park a little to the south of the Field Museum of Natural History, one of the greatest stadia of the age.

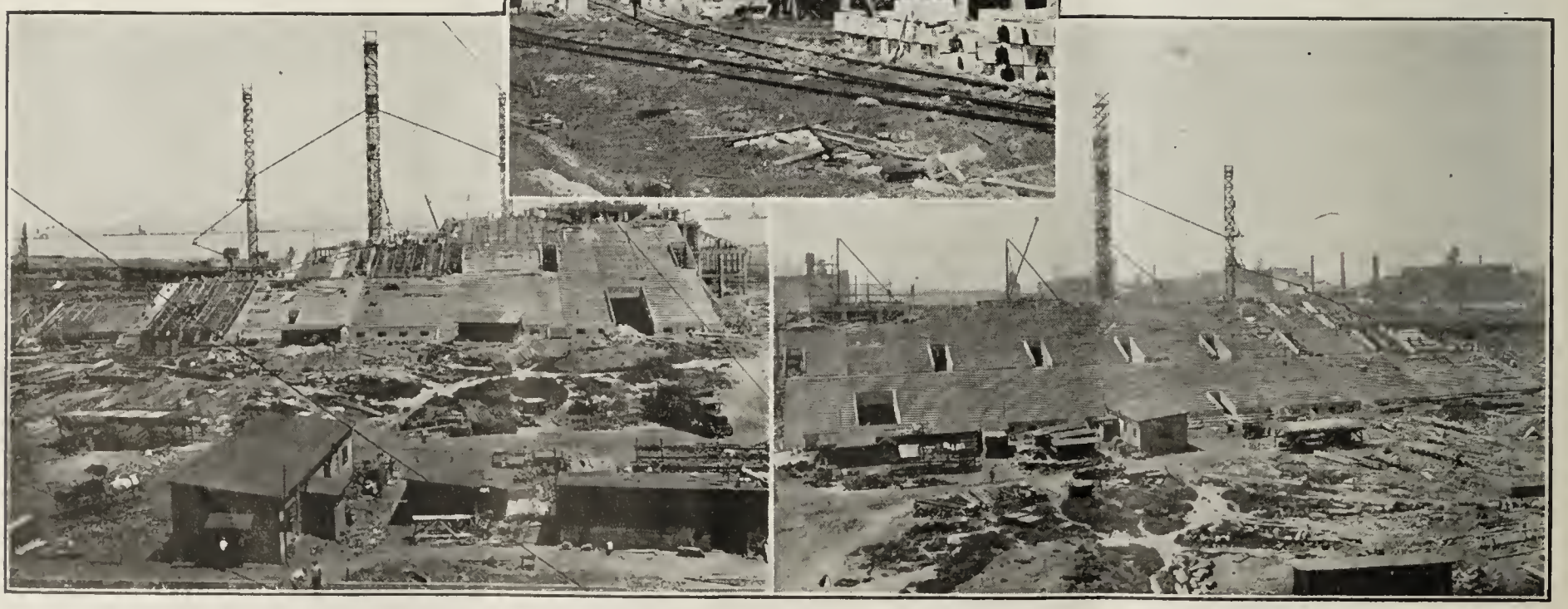
Complete plans call for a seating capacity of about 100,000 and a cost of about five million dollars, but the section now being built will hold sixty thousand permanent seats with possibilities for a great many more temporary ones in case of an emergency. The cost of the unit now under construction is in the neighborhood of three million dollars. The circular end will not be built immediately. In its stead a grassy bank, slashed with cement walks, will become an integral part of the ground design. Later, when the horseshoe is completed, a tower, surmounted by a slender flagstaff will rise from the circular end.

Chicago's memorial to the men who served in the recent World War, in addition to being of superior size, is distinctive for the reason that when finished it will represent one of the greatest precast concrete constructions ever attempted. All face stone for the building is being cast at a cost of approximately four hundred thousand dollars, by the Benedict Stone Corporation, of New York City, while the rest of the structure, including the viaduct to be built over the Illinois Central railroad tracks, is all of reinforced concrete construction.

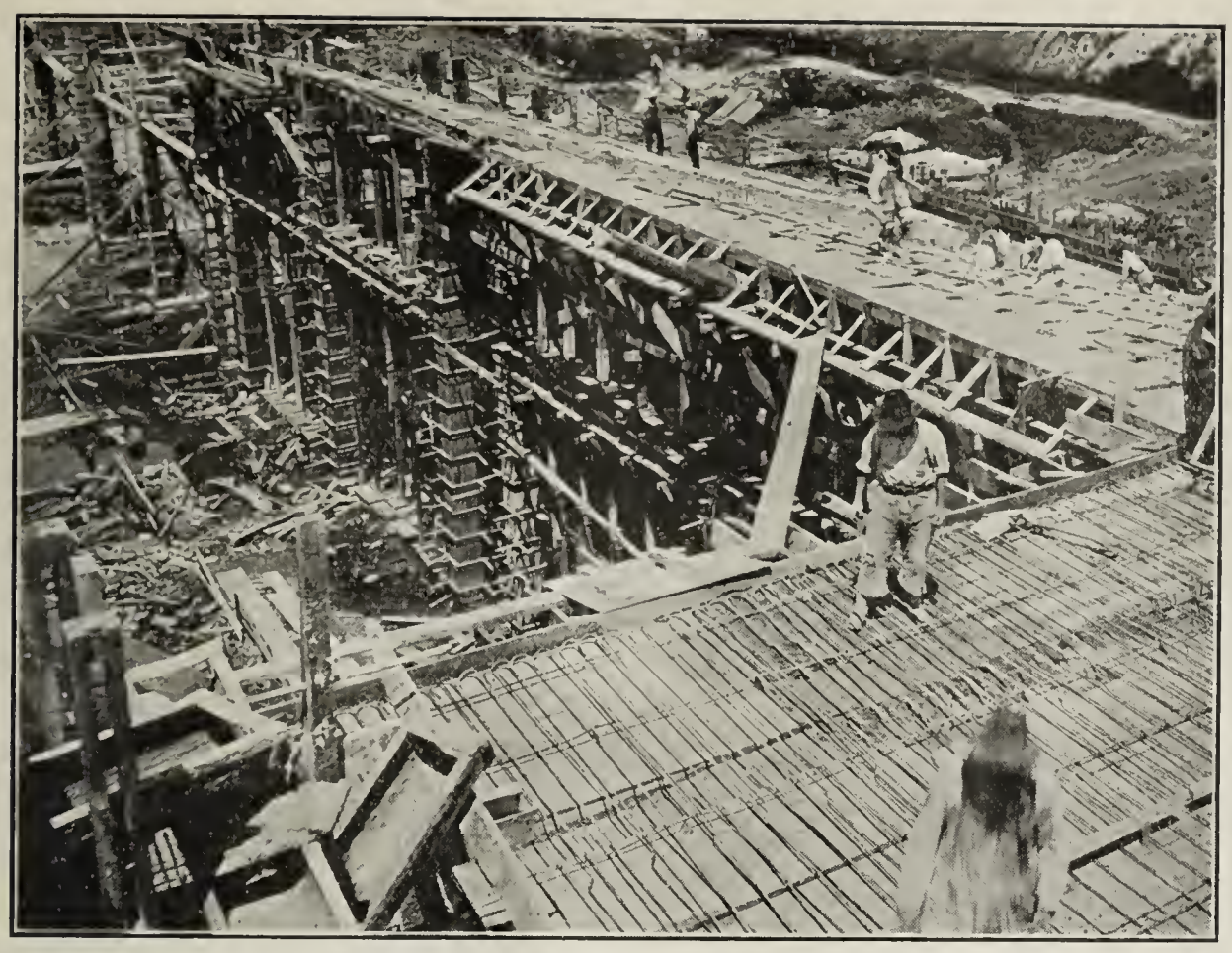
Two buildings are now being constructed facing each other across the 300 foot expanse of the arena. The one will be an almost exact replica of the other except that the plans are directly reversed. Each will be 1,014 feet long and 180 feet wide which makes the total width, with the arena, 660 feet, not including the surrounding grounds. The grounds will be laid out in a fitting design with gravel walks and plenty of shrubbery.

A six foot wall protects each side of the arena. Four feet above the arena level is the first row of seats. Seats go upward on a saucer-like slope to a landing twenty-eight feet above. Openings from the inside of the building come out upon this landing at regular intervals.

Each building is constructed in four sections. Section I, originally one-half of the circular end, will be taken up by



Three different views showing how rapidly the work is progressing. The top view in the group shows how the Benedict stone is being placed.



Showing how the reinforcement is placed.

the grassy bank. In section II the seats will continue upward on a saucer-like slope to a fifty-nine foot level. This section is 375 feet long and 180 feet wide.

In Section III the lower twenty-eight feet of the building will hold forty rows of seats. From this point up to the fifty-nine foot level is an earth bank upon which there will be standing room for visitors. Temporary wooden seats will be built upon this as occasion demands. Later the unit will be completed with permanent seats.

Section IV consists of a platform with terraces and broad steps. Gravel walks, through lawns and shrubbery, lead to this base. Between Sections IV of the two buildings is a gently sloping bank leading down into the depressed arena. By its use pageants or troops may march from the park into the arena without breaking formation. At the close of a day's events the crowd may swarm down into the arena and out to the park, up this broad slope. Quick clearance of the stadium is, in this manner, readily effected.

Each building is constructed in separate units. Each unit being connected to its neighbor by a half inch open joint to allow for expansion. The aggregate of half inch joints allows seventeen and a half inches for expansion in the length of the building. Each unit rests on its own pillars and each pillar rests on from two to twenty piles, according to the weight it has to carry. About 5,057 piles carry the weight of the entire stadium. They range in length between fifty-five and seventy feet and are driven down to the hard-pan overlying the bed-rock. They are cut off a foot below lake level so they cannot rot.

Just below each joint a copper trough collects dripping moisture and carries it downward to a drain trough on the arena side of the structure, close to the six foot arena wall. The ledges for seats slope a little so that rain water cannot settle upon them.

A projecting ledge from the arena side unit overlaps the unit next to it. The hooked ends of the reinforcing bars prevent any tendency toward breakage under the load carried when sport lovers begin to tramp to their seats.

Above section II, three feet above the topmost seats, a double row of 32 foot fluted columns placed at 24 foot intervals holds up a top structure roofing the colonnade and promenade. Each column is 6 feet in diameter at the base and tapers gradually upward to a diameter of four feet nine inches at the top. The columns are hollow, allowing certain ones to be used for smoke stacks and ventilating tubes.

Above the double row of 60 columns is a Grecian gable roof of the low, broad type, covered by tile roofing. Stair towers at the four corners of section II are finished off flush with the roof.

Below the roof and between the columns on the arena side, are circular openings for flood lights. Powerful electric searchlights, capable of being turned about on a socket, will flood the night events in the arena with profuse quantities of light. In similar positions, on the outside of the building, will be other circles of a like size. They will be closed, however, by slabs of precast stone.

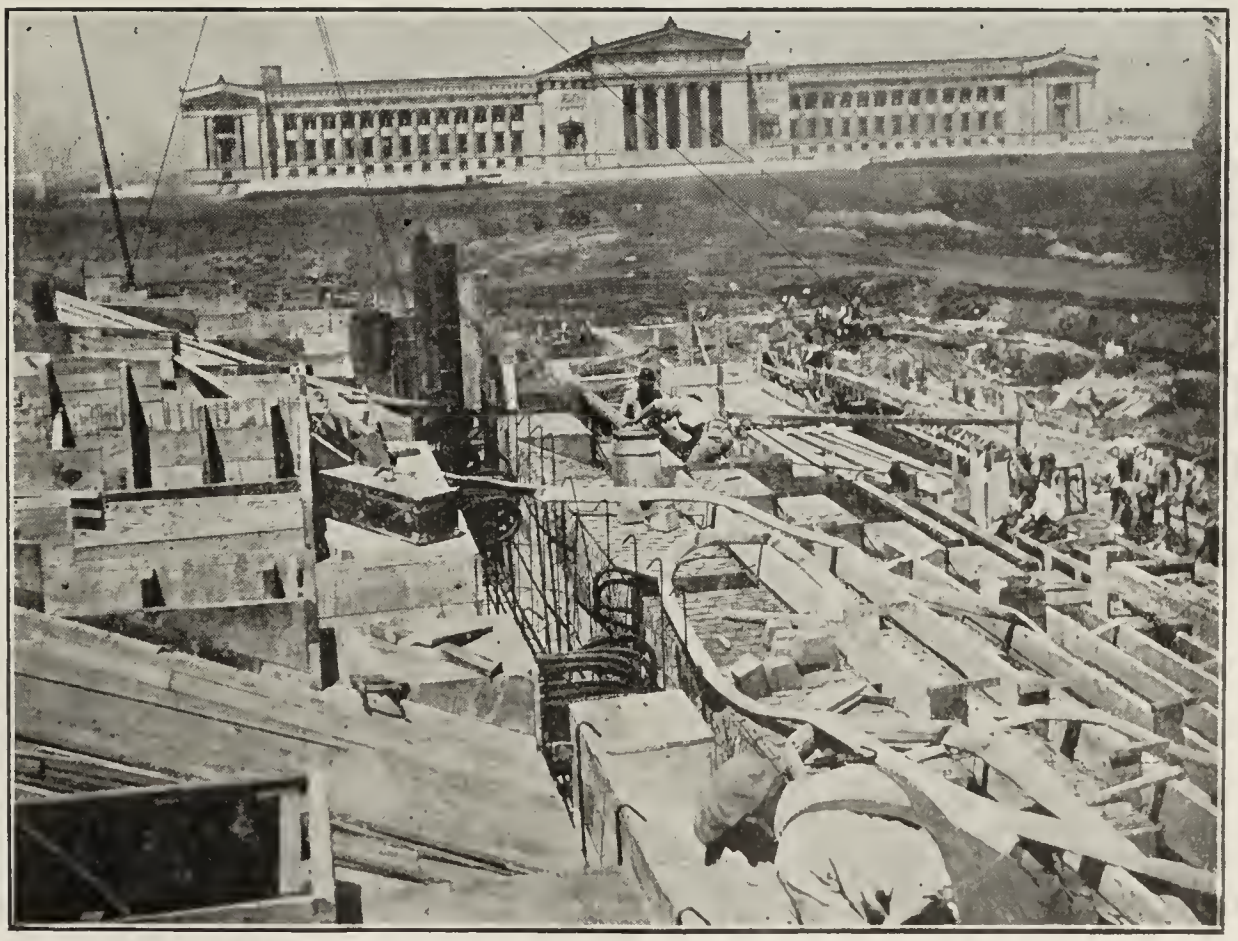
Between the columns, about three feet above the topmost seats in Section II is a promenade from which people can look over the heads of the seated crowd and watch the events in the arena more than 60 feet below. This promenade is reached by stairways in the four stair towers at the corners of section II.

The outside of the building is built of Benedict stone, a cast stone with a hard, smooth, glistening finish, possessing unusual lasting qualities. It comes in huge blocks, each block being numbered to fit in a certain place. By means of derricks they are lifted and laid in the same manner as cut stone.

The short hall-ways of the towered entrances open directly upon a huge exhibition hall 265 feet long and 50 feet wide with a 31 foot ceiling. Close to the ramps, which lead in a semi-circle upward to the second story, on the farther side, are half-circle indentations for refreshment booths. The floor is of tile and the walls are fittingly high for decorations. The hall is left free from obstructing pillars by means of a 100 ton girder, 8 feet and 11 inches high by 37 inches wide. This spans the distance between the pillars at either end of the hall. Smaller transverse girders cross it at intervals.

Two large ramps for the use of automobiles and trucks lead from the arena around the ends of the hall and along its farther side. Trucks go up these ramps from the arena to deliver exhibits and supplies for the exhibition hall.

In the second story are bathrooms, locker rooms, showers, etc., for the use of contesting athletes and partakers in the events for which the completed stadium will be used. A small room in the west building will contain all the electrical and lighting controls for the entire project. Heating will be done by



A detail at the north end of the work.

gas, each building containing its own separate heating unit.

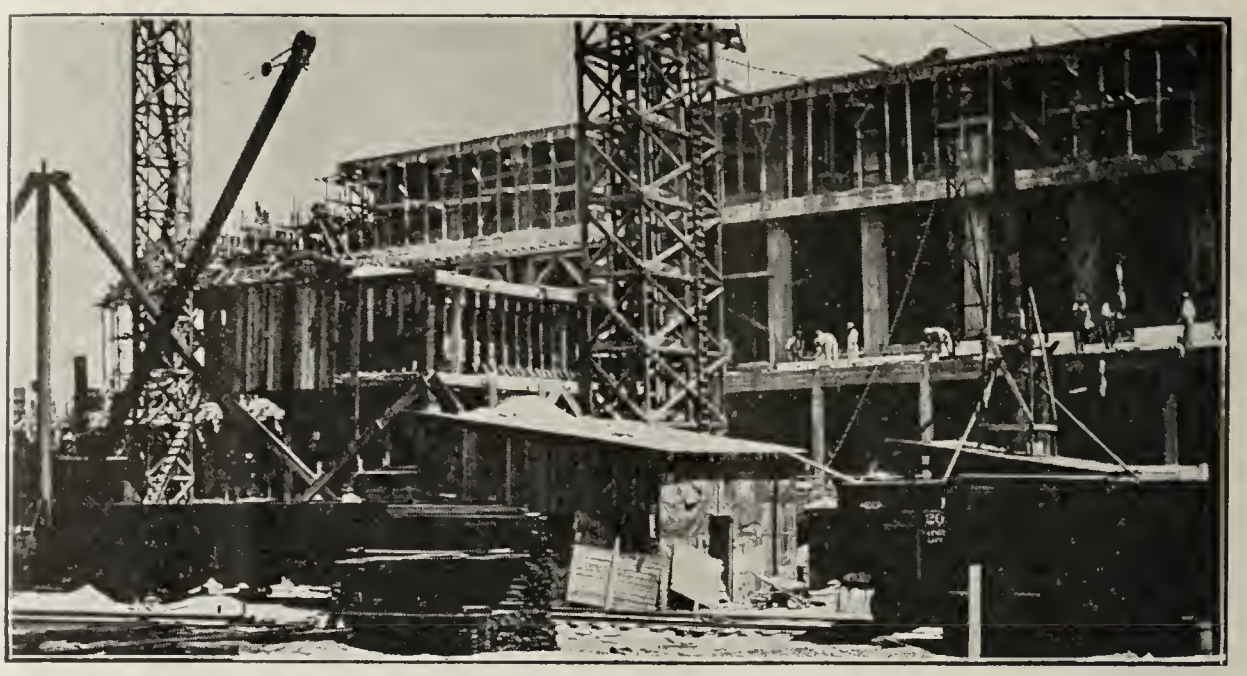
Two No. 28 batch mixers of one yard capacity are being used in the building of the stadium. Each mixer is placed on a small platform about six or seven feet from the ground. Above it is a large bin properly partitioned to hold 300 yards of stone and 15 yards of sand. Sand and stone feed directly into the mouth of the mixer from the hoppered bottom of the bin. Beside the mixer is a small storehouse for cement. It is open at the back end to facilitate wheeling sacks of cement to the mixer, into which it is dumped by hand.

Close to the storehouse is the central tower with the elevator which carries the concrete directly into the one yard hoisting bucket. Hoisting machinery carries the elevator high up this central tower to the chutes. The concrete is dumped into the chutes and slides down into the form being filled.

On either side of the central tower are two smaller towers which support the chutes for long distance work. They are of lighter construction than the elevator tower but their chutes are fed from the main tower. The central tower has three chutes—two to the smaller towers and one for work near its base. The chutes have a radius of 180 degrees and are large enough to carry the work of the mixer.

Here and there about the building are various derricks and pieces of hoisting machinery to lift the huge blocks of Benedict stone in place. Near the base of the central tower is a boom with a clam shell which unloads the coal for the steam engines and dumps it neatly in a pile to one side. Sand and stone are dumped into the hopper above the mixer by the same boom and bucket.

The materials used in the building of this project are generally accepted as standard and of the better grades. Because of the high cost of transportation, material, which meets with the required standards carried in stock by local dealers, is bought from them. The companies furnishing material are: Lehigh Portland Cement Co., Brownell Improvement Co., Thornton-Claney Lumber Co., Richardson Sand Co., Benedict Cast Stone Corp., Inland Steel Co.



Where the concrete is mixed.

The same may be generally said of the equipment used as of the materials. Each of the following companies play an important part in the building of the project by virtue of machinery being used in the constructing of the stadium. The Ohio Ceramic Engineering Co., and Ransome Concrete Machinery Co., mixers are used. The hoist buckets come from Ransome Concrete Machinery Co. The hoisting machinery comes from the American Hoist and Derrick Co., and Thomas Elevator Co. Schwab-Lezotte boilers are being used.

Transportation facilities for bringing material is excellent. A spur track from the Illinois Central railroad hooks around the two buildings. Smaller spurs branch from the large one and run close along the outside of the buildings. Cars of material are brought conveniently close to the hoisting machinery and can be unloaded in the most advantageous places. Later, when the project is completed, street car facilities will be afforded to bring the crowds right to the entrances of the stadium. Large viaducts over the Illinois Central railroad tracks will carry pedestrians.

It is expected that Chicago's Memorial Stadium will be complete by the later part of May, 1924. When finished it will be one of the outstanding attractions in the country. With pageants and Olympic events taking place there it will be the means of drawing numerous visitors to the central metropolis.

The California Highway Commission is now painting a white line down the center of the highway south of San Francisco as a safety precaution to motorists.

A very simple and efficient device is used for this purpose. It consists of a paint receptacle carried on a three wheel hand truck, with a hose leading from the receptacle to a paint brush attached to the front of the truck just back of the front wheel. This brush applies the paint to the surface of the highway and a second brush attached a few inches back of the first one spreads the paint to the proper width. A red line is chalked on the pavement ahead of the paint spreader to guide the operator.

A truck follows the paint spreader carrying wooden stands which are placed over the painted line about 15 feet apart to keep motorists from driving over the freshly painted pavement.

The largest swimming tank in the world has just been completed in San Francisco. It is entirely of concrete construction, is 1000 feet long and 100 feet wide, except for a center portion which measures 150 feet across. The pool cost

approximately $80,000 and will accommodate 10,000 bathers.

The depth of the tank will vary from three to nine feet with a 14 foot diving pit at one end. A fifty-foot concrete promenade surrounds the pool where seats will be provided for hundreds of spectators. Precast steps of reinforced concrete are provided along the walls of the pool every 100 feet.

Announcement has been made that the Fuller Engineering Co., whose main office is in Fullerton, Pa., will act as sole licensee for the Quigley Fuel Systems, Inc., and that it has also absorbed the Quigley engineering personnel.

Things That Make the Consumer Buy From You III

By John Lee King

Once upon a time (and this sentence isn't the beginning of a fable) I read a story which began, "When the world began, or in other words when I was born." The chap who wrote that story knows considerable about the inside of your head and mine, and of everyone of those Ultimate Consumers whose nickels and dimes and dollars we wish to have drop into our cash boxes for value received.

For, whatever position we occupy in life, be it president or garbage man, the most important person in all the world is the one person whom we can address as "I". Most of us won't admit it, because we are afraid of convicting ourselves of egotism, but that does not decrease the truth of this fact. Our pleasures and woes, our comings and goings, our children and families, are far more important to us than your pleasures and woes, your comings and goings, your children and families.

Now just what does this mean to you in your effort to induce the ultimate consumer to patronize you? As I see it, it means that you have got to defy the rules of psychology and in dealing with that Ultimate Consumer put yourself in his place, make his "I" your "I". Insofar as business goes, it is up to you to think of the Ultimate Consumer first and yourself last. And each Ultimate Consumer must be considered separately as the most important person in the world whenever and under whatever conditions he comes into contact with you.

Take the example of the man who sells me my glasses. I have dealt with him for more than twenty years and have had many opportunities to see him in action. No matter who comes into his office he addresses them personally by name. I have never met a man who has a greater faculty than he for remembering names of persons and facts about them. This one he asks about the baby, that one about how he has enjoyed fishing during the season, and for each and all he has some personal comment that makes them feel his interest in their comings and goings.

This man is selling considerably more than optical goods and the result is he is selling more optical goods than he would be doing if he stuck to the rote of asking "Is there anything more you wish?" He is selling along with glasses a satisfaction to that ego which is in all of us, feeding that hunger which is the result of the great importance of ourselves to ourselves. And the prosperity of his business is proof that the method is a good one to follow.

With this knowledge of the importance of the personal in business at our finger tips, and remembering to use it to the full, the business man who is located in a small community has a real advantage over the man whose business is in the large city. There is every reason why in the smaller town the merchant should know his customers—and those who he wants for customers—personally. He has only to keep abreast of the times by reading the local paper to know what the interests of the different people in town are: he has only to cultivate his memory and his real interest in their interests to make this knowledge infinitely valuable to him.

How Doctors Use It

Perhaps the greatest example of how this interest in the personal is made to pay dividends is shown by the average physician. True, he is in a peculiarly favorable position to use this method of salesmanship to the utmost since he is brought into intimate contact with the families of the community. He knows the likes and dislikes, the sorrows and joys of those to whom he ministers and naturally his sympathies are broad so that his interest in their affairs is real and active.

Frequently when he makes a call much of his time is taken up in talk about these interests; he spends far more time in such talk than he does in mixing medicines or prescribing remedies. The result is he is credited with being a good doctor, and the next time Willie has a cough or Betty a fever, he'll hear his telephone ring and shortly his Ford or his auto will be stopping at Willie's or Betty's father's door.

Take another case—that of the salesmen who drop into see you with the hope of selling you a stock of materials. Some of them come in and "talk shop" from the time they shake hands until they say good-bye; others are interested in your prosperity and the conditions in your community and, apparently, only incidentally mention the goods they have to sell. In this case you are on the other side of the fence; to them *you* are the Ultimate Consumer and it is to the ego in you that the latter type of salesman is appealing. Think a moment, and I am sure you will agree with me that the chap to whom you most gladly give an order is the fellow who shows a real interest in your business, rather than to the chap who is so interested in his business and in getting an order that he hasn't time to talk about anything else.

While we are discussing these salesmen, let me digress long enough to suggest that the retail merchant of cement and building materials who will take the time to let these chaps who call upon you talk will learn much that will help him in his business. They come in contact with the retailers of the country and frequently can pass along tips that are invaluable in the battle that must ever be waged in order to keep business going well. They are a traveling school of salesmanship and the tuition is free. All that is necessary is an attentive ear and the adaptability to put those of their tips that are worth while into practice.

The Importance of Little Things

To get back to the main thread of this article: If you can create in yourself a true interest (an interest that is actual instead of assumed) in the affairs of the individuals in your community, then there is a certain increase that will invariably come your way. After all, it is the little things that make the difference in businesses that are large and those that are small. The big things occur so seldom and by their very bigness impress their importance upon you; the little things are easily overlooked, and can do more damage or good than all the big things put together.

The ultimate consumer drops into see you and is all set to talk over something with you that is of great importance to him, but to you is either entirely outside your interest or so much in the day's work that it is trivial. Let him gather that you don't consider his matter or problem important, and you have lost a possible or actual customer; make it your business to consider it important and you are the merchant he will patronize.

And along this line, in your correspondence be personal. The old time correspondent gloried in the editorial "We." He seemed to think that the plural, and the firm name, gave an importance to his letters that justified their use. But the thing that is important is not the firm, but the customer. When you write him you can make him feel far more important if you turn the "We" into "I" and let him realize that there is an individual in the firm who is personally interested in the business he has to offer.

Study the local paper, know what is what with your customers, actual and to be, and then use that knowledge constructively to produce business and to keep customers after they have been won. Children are the most important thing that most of your customers have; be interested in them, and courteous to them, and there will be a return in business.

For, since the world began only when I was born, I'm a mighty important individual, especially to myself. And don't forget it, if you want my business. In this democracy we are all kings and potentates, especially when we deign to patronize a grocer or dry goods firm, or building material merchant, and we demand, if you please, that you recognize our importance.

And at that, we are right in considering ourselves important. For most of us Life means a submerging of our personality in order to earn the wherewithal to buy the necessities of life. Out in the swim of business affairs we are small indeed—clerks, office boys, or, at best, a person with an important sounding title that wins us but a small place in the sun. Yet in each of us is born that demand to be considered important; that need to be called "Mister" in a respectful tone.

Consequently many of us must look to the tradesmen we patronize to furnish us with that much-needed and more-craved commodity, expressed respect. Our wife won't give it to us,—she knows us too well; our children soon get filled up with an importance all their own, and take us for what we are, the providers of the money which buys their needs and amusements. Consequently, when we find a tradesman who feeds us the rich food of respect—real, sympathetic, interest-full respect—he's the chap that gets our business.

And isn't that an easy, economical way to increase your bank account?

New Publications

The Link-Belt Company, in a special bulletin, has announced the further reduction in price of its "Cub" portable loader from $585 to $550. Increased production with consequent reduced manufacturing costs is given as the reason.

"Apparatus Used in Highway Research Projects in the United States," is the title of a bulletin issued by the National Research Council under the editorship of C. A. Hogentogler, highway engineer, bureau of public roads. The booklet, heavily illustrated, gives complete descriptions of all apparatus used in the various government highway projects, and should be a very valuable addition to the library of anyone who is connected with road work, as it combines technical accuracy with practical utility in its descriptions.

The North American Industrial Trans-Atlantic Company, Inc., of New York City, has issued a new price list and description of hydraulic presses for manufacturing cement floor tiles. The bulletin is printed in both English and Spanish.

Putting a wealth of information in a fifteen page bulletin, the Portland Cement Association has published a most valuable piece of work in its "Concrete Floors." The booklet gives detailed specifications for all types of concrete flooring, discussing coverings, colorings, and other points in addition to taking up in detail dimensional requirements.

The latest issue of Mine and Quarry, published by the advertising department of the Sullivan Machinery Company, of Chicago, contains interesting stories regarding the use of its equipment in operation and construction. "Slushing Ore With Portable Hoists," "Air Power Helps Build a Kentucky Highway," "Paving Breakers Expedite Street Re-grading," and "Compressed Air Runs Shovels in Cleveland Water Extension," the names of some of the articles, help to convey an idea of the scope of material handled in its forty-five pages.

"Move Your Oldest Stock First," and "Small Diameter Dynamite Cartridges Inferior" are the names of two new leaflets published by the Atlas Powder Company, of Wilmington, Del. The first takes up with both dealer and consumer the advisability of using fresh stock as far as possible, while the second, an extract from the report of the Bureau of Mines, discusses the advisability of the use of larger diameter drill holes in blasting operations.

The Underwriters' Laboratories have published a new list of inspected mechanical appliances inspected for accident hazard. Other information of interest to operators is also included in the bulletin, which may be obtained at the main office, No. 207 E. Ohio St., Chicago.

"Nineteen Stories of Lime," the new publication of the National Lime Association of Chicago, takes up the question of the use of lime in concrete. Several illustrations are included which depict structures in which this combination has been used to apparent advantage.

Sauerman Bros. of 462 S. Clinton Street, Chicago, have announced the publication of a new thirty-two page booklet descriptive of their power drag scrapers and portable scraper outfits. This new pamphlet contains thorough and useful information on the design and construction of this type of equipment, illustrating comprehensively the many ways of adapting power scrapers to the conditions and requirements of various excavating and material handling propositions.

The Blaw-Knox Company of Pittsburgh is distributing its bulletin 812 devoted to the Blaw-Knox single line buckets. The bulletin is very well planned and splendidly illustrated showing the various applications to which the bucket may be put. There are also several diagrams detailing the different parts of this important apparatus.

"A Book of Illustrated Economies" is what the Shepard Electric Crane & Hoist Company, of Montour Falls, N. Y., calls its new bulletin, describing and illustrating "an electric hoist for everybody." The book, by means of pointed argument and colored illustrations, shows actual cost figures attendant upon the use of Shepard equipment. Its sixty-eight pages are so arranged as to give the enquirer ready access to desired information.

The Hoar Shovel Company, of Duluth, Minn., under the caption of "Hoar 'Baby' Shovels," has issued a catalogue showing the use of its equipment in underground mining and loading. An attempt is made to give "an idea of what has been done towards eliminating hand loading underground."

The Hoar shovel "will duplicate every motion of the time tested standard steam shovel and still operate in very confined spaces, underground, and on the surface."

There follows a complete discussion of the construction and operation details of the products, together with testimonials and actual cost records. Illustrations, numerous and to the point, give the bulletin special value and interest to all men who are interested in mining or quarrying operations.

The Chain Belt Company, of Milwaukee, has published a catalog descriptive of the new mixer models recently announced by the company. The new machines, it is claimed, are the fastest charging concrete mixers of their type yet developed. It takes but eight seconds to discharge the mixing drum on these models, and on one type the charging skip can be raised in five seconds, remarkably fast time in both cases.

Of more than usual interest are the beautiful cast stone buildings of the Catskill Aqueduct, supplying water for the city of New York.

The walls of these buildings were constructed entirely of artificial stone manufactured by casting in sand molds large blocks of concrete made of a mixture of cement and Tuckahoe or Gouveneur marble. Tuckahoe marble, a pure white product of finest quality, produces concrete nearly white in color, but for this purpose a buff tone was desired, which was secured by the addition of small quantities of buff iron oxide. The concrete mixture is the same all the way through.

The beautiful surface texture was obtained by tooling in the same manner as natural stone. Some of the work was tooled at the factory, other parts on the job. Much favorable comment has been attracted to the work, particularly because of the pleasing variation in color tones produced by slightly varying the mixtures and methods of curing.

The illustration shows a Lock Block showing top end interlocking features, manufactured with the lock block machine made by the Concrete Block Machine Company, of Newark, N. J. The standard size of these blocks is 8 by 7¾ inches, allowing a quarter inch joint so it will lay up 8 by 16 inches, in the wall. There are extra attachments for making blocks 10 inches and 12 inches thick.

The lock block machine was developed after a careful study of the needs of the concrete block industry and is simple in construction and operation. It is a speedy, face down semi-wet machine with no wearing parts, therefore easy to clean. It makes all of the different faced and shaped blocks required for a complete building, such as straight, corner, jamb, straight end and fractional blocks, all with the perfect interlocking features.

Portland Cement Output in July

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for July, 1923, were made necessary by the lack of returns from one producer.

Production, Shipments, and Stocks of Finished Portland Cement, by Districts in July, 1922 and 1923, and Stocks in June, 1923, in Barrels

Commercial District	Production July		Shipments July		Stocks at end of July		Stocks at end of June
	1922	1923	1922	1923	1922 (a)	1923	1923 (a)
Eastern Pa., N. J. & Md.	2,842,000	3,216,000	3,551,000	3,484,000	2,457,000	2,814,000	3,082,000
New York	569,000	654,000	662,000	730,000	732,000	655,000	730,000
Ohio, Western Pa. & W. Va.	1,240,000	1,284,000	1,352,000	1,442,000	1,014,000	757,000	915,000
Mich.	722,000	783,000	871,000	895,000	437,000	320,000	433,000
Ill., Ind. & Ky.	1,960,000	1,817,000	2,673,000	1,848,000	920,000	497,000	529,000
Va., Tenn., Ala. & Ga.	550,000	626,000	565,000	583,000	319,000	234,000	191,000
Eastern Mo., Ia. & Minn.	1,106,000	1,259,000	1,492,000	1,544,000	851,000	1,014,000	1,299,000
Western Mo., Neb., Kan. & Okla.	843,000	956,000	810,000	1,062,000	841,000	873,000	978,000
Texas	362,000	397,000	424,000	411,000	173,000	187,000	201,000
Colo. & Utah	272,000	256,000	274,000	276,000	175,000	159,000	178,000
Calif.	715,000	1,083,000	761,000	1,069,000	235,000	169,000	156,000
Ore., Wash. & Mont.	376,000	289,000	415,000	368,000	279,000	397,000	476,000
	11,557,000	12,620,000	13,850,000	13,712,000	8,433,000	8,076,000	9,168,000

(a) Revised.

Stocks of clinker, or unground cement, at the mills at the end of July, 1923, amounted to about 3,865,000 barrels compared with 4,172,000 barrels (revised) at the beginning of the month.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in June, 1923, amounted to 111,559 barrels, valued at $180,146. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in June were from England, 36,370 barrels; Denmark, 29,400 barrels; Quebec and Ontario Provinces, Canada, 19,153 barrels; Norway, 15,454 barrels; Belgium, 6,172 barrels; other countries, 5,010 barrels. The imports were received in the following districts: Oregon, 17,878 barrels; North Carolina, 17,277 barrels; Vermont, 15,156 barrels; Porto Rico, 14,066 barrels; San Francisco, 12,540 barrels; South Carolina, 11,897 barrels; New Orleans, 9,043 barrels; Georgia, 6,172 barrels; other districts, 7,530 barrels.

The exports of hydraulic cement in June, 1923, were 77,203 barrels, valued at $236,166, of which was sent to Cuba, 29,929 barrels; to the other West Indies, 6,464 barrels; South America, 25,720 barrels; Mexico, 9,972 barrels; Central America, 2,635 barrels; Canada, 1,438 barrels; and to other countries, 1,045 barrels.

The statistics of imports and exports of hydraulic cement in July, 1923, are not available.

Imports and Exports of Hydraulic Cement, by Months, in 1922 and 1923, in Barrels (a)

Month	Imports		Exports	
	1922	1923	1922	1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	111,559	96,263	77,203
July	957	(b)	119,491	(b)
August	56,757	.....	105,156	.....
September	c42,641	.....	78,615	.....
October	d65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823	.....	1,127,845	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce. (b) Imports and exports in July, 1923, not available. (c) Covers period Sept. 1-21. Imports Sept. 22-30 included with Oct. (d) Includes imports period Sept. 22-30.

Sugar Affects Concrete

An example how even very small quantities of organic matter are influencing the setting and the ultimate quality of concrete, is given by Dr. Hundeshagen in "Zement." It has been observed that a concrete floor in a sugar factory was not setting, though the mortar had been prepared in the ordinary way in a proportion of one part of cement to 3 to 4 parts of gravel and sand, and that the work been conducted with the usual precaution. It was noticed that three-quarters of the concrete which had been mixed first, were not binding. The surmise that in spite of the careful preparation some sugary substance had been mixed up with the concrete, was confirmed by experiments. It was found that the contents of sugar in the bad concrete was 0.06 to 0.08 per cent in the mortar or 0.3 to 0.4 per cent in the cement. Further tests proved that even 0.1 per cent of sugar in the cement, equal to 0.2 per cent in the mortar, setting was very slow and the concrete was crumbling if slightly shaken.

An addition of five per cent of sugar to the cement or one per cent to the mortar seemed at first to give better results. The setting appeared to progress normally. After a time however white efflorescence became visible. The outside appearance was that of ordinary concrete, but a very slight stress broke the test piece, and showed that it was soft and cracked inside. All the test pieces containing sugar gave a hollow sound when tapped with a hammer.

Cement Profits

For the first time in the history of the cement industry in the east, an impartial analysis of the profits of cement manufacturers, made by H. Parker Willis, Professor of Banking at Columbia University, has just been completed. Professor Willis' report covers earnings and operations for the year 1922. It is based on the operating returns of eleven of the principal Eastern cement companies as reported in their income tax statements to the Treasury Department.

According to Professor Willis' report, the eleven companies whose operating figures were analyzed show an average return on their actual investment of about 7.3 per cent for the entire group. Returns earned by the individual companies vary widely. Several were operated at a net loss and the largest percentage of return was by no means obtained by the largest companies. It is also pointed out in this connection that the production of the mills covered in the report was the greatest in their history.

"It would appear," says Professor Willis, "that whether viewed as a return upon business turned over or upon the value of the output; or whether viewed as a return upon actual investment, the earnings of representative cement producers during the year 1922 have been well below the average obtained by industrial undertakings at large.

"From this point of view too, it is noteworthy that the eleven companies under study materially reduced their prices during 1922, receiving on the average $.15257 less per barrel than in 1921. This figure represents the difference between an average 1921 price of $1.75453 and a price for 1922 of $1.60196 as reported."

"For the eleven companies under consideration, this output was 28,774,191 barrels, or over 25 per cent of the entire product of the country as a whole. Gross sales of the eleven companies, comprising both new and old product, were worth $49,592,872. The relationship between the output thus indicated and the capital invested will be inferred from the statement that the aggregate net worth of the invested property of the concerns as reported was $87,003,767.

"On this actual investment, the eleven mills have earned a total net income after expenses and taxes amounting to $6,363,461, or an average return of about 7.3 per cent for the entire group.

"Total cash dividends declared during the year 1922 were $2,278,634, or an average percentage of slightly over 3.5 per cent on a total capitalization of $64,664,-061 (reckoning both common and preferred stock as the basis of computation.) Four companies declared no dividends whatever. Two stock dividends were declared, amounting together to $2,823,900, or slightly less than 4.6 per cent on the combined capitalization just mentioned.

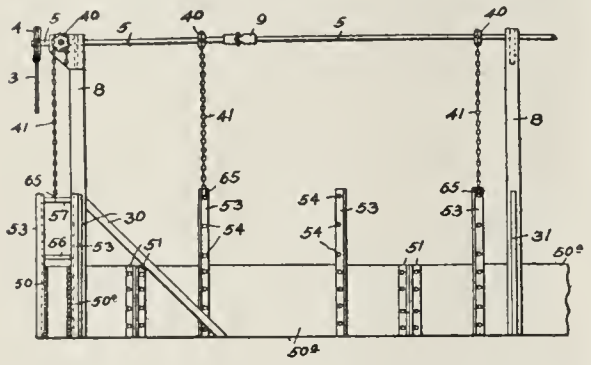
"In view of the fact that, during the discussions of industrial earnings in recent years, much has been made of statements that earnings returns were frequently vitiated by the existence of very large allowances for depreciation, it is especially worth comment that total allowances for depreciation and depletion of every kind aggregated, during the year 1922, for this group of companies, a total sum of $2,984,014, or the equivalent of about 3.4 per cent of the entire net worth of the group as already stated.

Interesting Cement Patents

Recent Patents of interest to readers of Cement and Engineering News specially prepared for this publication by Clarence A. O'Brien, Registered Patent Attorney, Room 69 Southern Building, Washington, D. C.

1,464,600. CONCRETE FORM. William S. Dunham, Sharpsville, Pa. Serial No. 457,400. 5 Claims. (Cl. 25—131.)

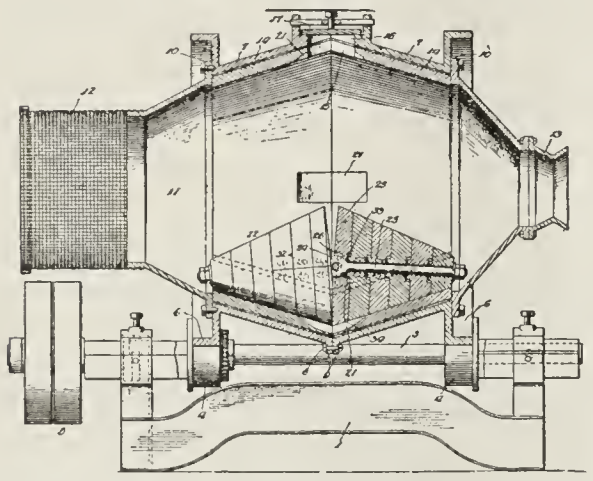
1. Apparatus for molding concrete walls comprising two metal plates spaced apart the width of the wall to be made, said plates having attached to their exterior sides upright members extending above the



upper edges of the plates, said extensions in that portion above the plates having three or more pairs of aligned perforations therein, and two or more removable cross members adapted to engage corresponding pairs of perforations whereby to hold the plates accurately spaced apart in vertical relation while permitting the removal of one of said cross members.

1,463,921. CRUSHER. Oliver J. Moussette, Richmond Hill, N. Y. Serial No. 593,839. 6 Claims. (Cl. 83-6.)

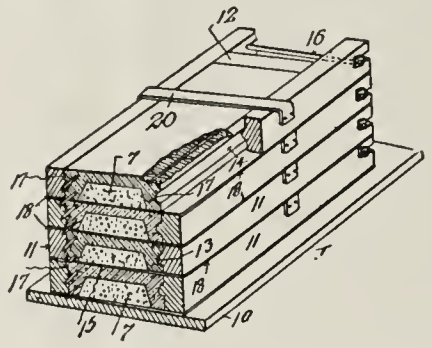
1. In a crusher of the drum and roller type, the combination with a tapered drum,



of a tapered continuous metal lining therefor, the lining and the drum being provided with registering longitudinally extending grooves in their opposed surfaces, and a plastic binder filling the space between the drum and the lining and filling the said grooves to form keys preventing relative circumferential movement of the lining and the drum.

1,463,841. METHOD OF MAKING CONCRETE BUILDING BOARDS OR SLABS. Wallace Clinton Richman, Butte, Mont. Serial No. 278,644. 1 Claim. (Cl. 25—155.)

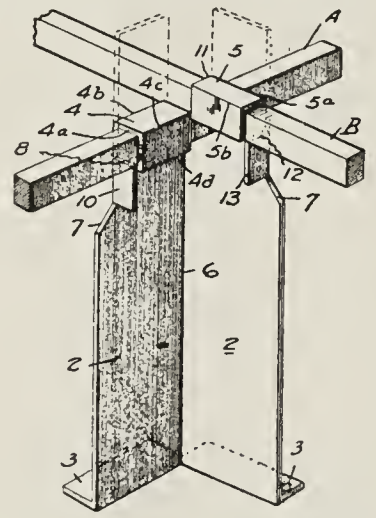
In the manufacture of building boards or slabs, the method which consists in forming a core within a core mold, then removing the core mold and surrounding the formed core with a frame to form, with the core, a board or slab mold, then filling the board or slab mold with concrete, then forming another core on the board thus produced, and applying a frame thereround to form a second board mold and filling the second board mold with concrete and repeating the operation to form a stack or pile of boards within their molds, and permitting the boards to set and harden, then removing the board mold



frames and moistening the stack or pile of boards within their molds, and permitting the boards to set and harden, then removing the board mold frames and moistening the stack or pile of boards to hydrate the cement content thereof, and finally separating the boards and cores.

1,464,886. MEANS FOR HOLDING RE-ENFORCING FABRICATION OF CONCRETE FLOORS AND SLABS. Christopher Henry Snyder, Berkeley, Calif. Serial No. 414,908. 7 Claims. (Cl. 72—122.)

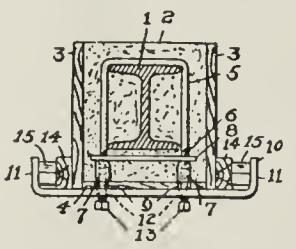
1. A chair for supporting re-enforcing rods, comprising a standard having angularly folded, longitudinal flanges and being



slotted inwardly from one end along the hip of the fold, the bottom of the slot forming transverse seats, at right angles to each other, for rods; the separated ends of the flanges constituting wrapping means to be folded around an applied rod.

1,463,967. HANGER DEVICE FOR CONCRETING STRUCTURAL BEAMS. Sanford I. Pedigo, Pittsburgh, Pa. Serial No. 585,136. 3 Claims. (Cl. 25—131.5.)

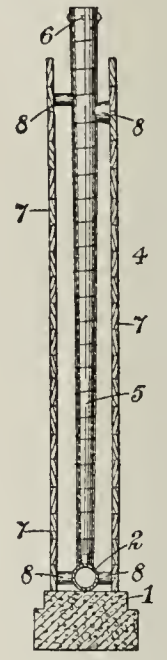
1. A supporting device for concreting structural beams comprising a reinforcing hanger having depending portions pro-



vided with threaded ends and straddling said beam, a sleeve coupling mounted on each of said depending ends, a tie bar having vertically disposed members, and a bolt extending through said tie bar and engaging with each of said sleeve couplings for securing the complete form in position.

1,465,222. METHOD OF MAKING CONCRETE STRUCTURES. Richard Gervase Kirton, Perth, Western Australia, Australia. Serial No. 580,292. 10 Claims. (Cl. 25—155.)

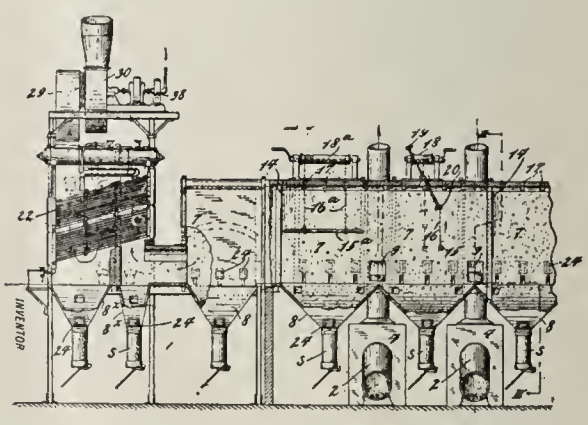
1. The method of constructing vertically in the position it is to finally occupy a hollow concrete structure consisting in wrap-



ping a tube with compressible material lubricated to permit easy sliding of the tube out of said wrapping, which tube is of the length and size necessary for a core for the hollow portion of the structure, mounting said tube vertically in the site where the structure is to be formed, placing the concrete round the tube and after allowing the same to set withdrawing the tube from its wrapping.

1,463,363. CEMENT-KILN SYSTEM. David S. Jacobus, Jersey City, N. J., assignor to The Babcock & Wilcox Company, Bayonne, N. J., a Corporation of New Jersey. Serial No. 115,507. 17 Claims. (Cl. 183—120.)

1. Apparatus for treating dust-laden cement kiln gases, comprising a flue arranged to permit a current of dust-laden



gases to flow substantially unobstructedly therethrough without substantial change in the general direction of flow in its passage through said flue, said flue having refractory heated side walls exposed to the current of gases for the collection of a caking material, and a plurality of baffles projecting a short distance from each of said side walls at spaced intervals along the length of the flue and adapted to cause eddies in the current to bring different portions of the bases into contact with the side walls, said side walls being accessible for cleaning while the apparatus is in operation.

Phoenix Not Involved

When the R. L. Dollings Company of Ohio, capitalists, were recently forced into the receiver's hands, newspaper reports intimated that the Phoenix Portland Cement plant at Nazareth, Pa., and the new one at Birmingham, Ala., were involved. In reply to a query by CEMENT AND ENGINEERING NEWS, President Lindley C. Morton, of the Phoenix Portland Cement Company, outlined his position as follows:

"The Ohio Company entered into negotiations with us to purchase the stock of the Pennsylvania Company about the time we contemplated building at Birmingham. A considerable amount of money was paid on purchase price and then the Ohio Company defaulted in further payments. In adjustment of the matter, the Pennsylvania Company deeded the Birmingham plant to the Ohio concern, but with reservation that we have the exclusive use and occupancy of the Birmingham plant for fifty years. The deed was signed, sealed and delivered and exactly expresses the status.

"The Pennsylvania Company has no connection whatever with the Ohio Company or the Dollings interests and they do not own any stock or securities of our Company or have any claim against us. We own the Nazareth plant and operate the Birmingham plant as our own for a term of fifty years. The Birmingham plant is operating very satisfactorily. We have a large amount of business booked and are delighted with our investment here. The litigation in Columbus, Ohio, and the appointment of a receiver for The Phoenix Portland Cement Company of Ohio do not affect us in the slightest way, except in the matter of the confusion of names."

Building Costs Rise

WASHINGTON, August 28.—The July issue of the *Survey of Current Business* published by the Department of Commerce contains the following relative to building construction and cement production:

"The cost of building continued to rise in May and averaged about two per cent greater than in April, and about 115 per cent above the pre-war average.

"The contracts awarded in May for building in twenty-seven northeastern states amounted to 60,430,000 square feet, valued at $374,000,000. The dollar value of building contracts awarded during May was five per cent greater than in the preceding month, while the floor space was six per cent less. During the month contracts for industrial buildings and business buildings, in point of floor space, increased, while all other classes declined from the preceding month.

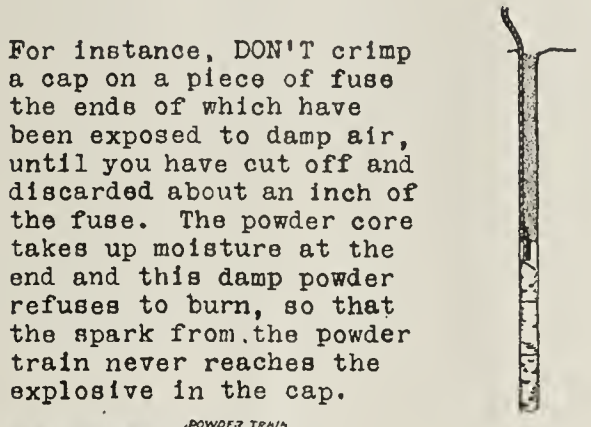
"Cement production and shipments increased while stocks declined. The total production for the first five months of the year were forty per cent greater than the production in the corresponding period of last year. Concrete paving contracts let in May were greater than in April but less than in May a year ago."

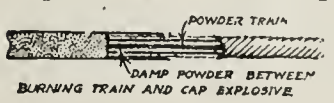
The Murray Rubber Company of Trenton, N. J., has announced a new line of mechanical rubber goods including transmission, conveyor, elevator beltings, hose of various kinds used in industry as well as hose for air, water and garden purposes.

In the Interest of Safety

Did you ever consider that there is a right way and a wrong way to crimp a blasting cap on a piece of fuse?

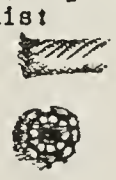
For instance, DON'T crimp a cap on a piece of fuse the ends of which have been exposed to damp air, until you have cut off and discarded about an inch of the fuse. The powder core takes up moisture at the end and this damp powder refuses to burn, so that the spark from the powder train never reaches the explosive in the cap.





Cut off a single length of fuse at least long enough to reach 2 or 3 inches beyond the collar of the bore hole, and crimp the cap on the freshly cut end. The use of "short fuse" or "skin-'em-backs" is prohibited by law in some states. It is not only dangerous but also wasteful because you cannot tamp the hole effectively and so do not get full execution from the explosive.

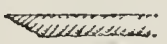
DON'T cut the fuse with a dull, dirty knife or a hatchet. It is always sure to smear some of the waterproofing in the fuse across the powder train like this:

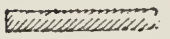


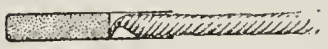
Use a du Pont Cap Crimper to cut the fuse as it makes a straight cut like this:

DON'T cut the fuse at an angle like this. The pointed end is likely to bend over and cause a misfire.

If you use a knife, keep it sharp and clean and cut the fuse straight across as shown below:

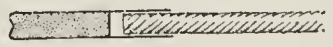


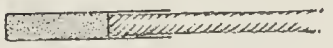




DON'T leave an air space between the end of the fuse and the fulminate in the cap as this may prevent the spark of the fuse from igniting the fulminate in the cap.

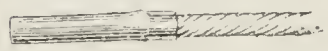
Slip the cap over the end of the fuse until the fulminate in the cap touches the end of the fuse.





DON'T crimp the blasting cap with your teeth. Men have been killed doing this, and even if you are not killed, it does not make a good tight crimp.

Hold the cap and fuse in this position and then crimp the cap as near as possible to the open end with a du Pont Cap Crimper.



If everyone would make up primers as approved and avoid the practices condemned, better results from blasting with cap and fuse will be secured.

Here and There In the Industry

W. H. L. McCourtie, president of the Trinity Portland Cement Company, now operating in Dallas, Texas, and building a new mill in Fort Worth, C. E. Ulrickson, vice president and general manager, and O. V. Bartholomew, general superintendent, spent several days of August in Chicago buying new machinery and equipment. They state that they hope to have the new plant in operation by next April.

The Huron Portland Cement plant at Alpena, Mich., which was severely damaged by fire during the last part of July, has been consistently rushing repair work and will soon be back on the normal full production basis, reports state.

Work has been started on a new million dollar cement plant at Bonner Springs, Kansas. The mill is being built by the Sunflower Portland Cement Company under a contract awarded to the Heine Company, New York, and Tuttle, Ayres and Woodward, of Kansas City. The plant will be ready for operation about the first of March.

The State administrative board of Michigan is investigating the possibility of a state owned plant as a protest against what it terms "exorbitant prices."

The Southern Pacific system estimates that it saves from $28,000 to $50,000 a year by taking care of and returning all of its cement sacks, a news item reports.

Although consignments of foreign cement are still coming into California, largely on past orders, the flow of the European product has been almost entirely halted because of the fact that local cement mills have, by eliminating duplicate orders, found it possible to take care of the demand. The "Patronize home industry" idea is being pushed, so that contractors are ordering the American product in preference to imported cement. Press dispatches indicate that the reported shortage was never so bad as it had seemed to be.

The Hawkeye Portland Cement Company, formerly incorporated under the laws of West Virginia but operating in Des Moines, Iowa, recently qualified before the secretary of state of Iowa to operate there.

Big celebrations attended the breaking of ground for the new National Cement Company's plant in Montreal, Canada. The company is dominated by American interests.

The Lehigh Portland Cement Company is spending about $35,000 for a dam at Sullivan Lake, Washington, to furnish power for its plant. The mill is now shut down and all of the men are either working on the dam or repairing machinery. Production will probably be resumed some time during the first part of this month.

The Pyramid Portland Cement Company recently began production in its new plant at Des Moines, Iowa.

The Southland Portland Cement Company of Nashville, Tenn., has been incorporated for $1,000,000 and will erect a 3000 barrel plant at Crab Orchard, Tenn.

A. O. Neaman, R. M. Somill and others recently incorporated the Gonzales Cement Works at Gonzales, Texas.

The Security Cement and Lime Company, of Security, Md., has completed additions and improvements by virtue of which its capacity is increased from 3000 to 5000 barrels daily.

The new plant of the Sun Portland Cement Company, of Lime, Oregon, is expected to begin production about the first of next month.

The Carney Cement Company, of Carney, Minn., has recently begun production in a new unit of its plant, increasing its capacity by 1500 barrels a day. Further additions planned will eventually bring the output of the plant up to 9000 barrels daily.

J. H. Kempster has been appointed General Superintendent of the Buffington plant of Universal Portland Cement Co. located at Buffington, Ind., succeeding the late C. O. Soderquist. This plant consists of mills No. 3, 4 and 6. In 1907, two years after graduating as chemical engineer from the University of Michigan, Mr. Kempster entered the service of the company as chemist of plant No. 2, at South Chicago. In 1908 he was appointed chemist of the Buffington plant. In May, 1915, Mr. Kempster was advanced to the superintendency of mills No. 3 and 4. Three years later he became superintendent of mill No. 6 which position he has held until his present appointment as General Superintendent of Buffington Plant.

The Atlas Cement and Plaster Company, of Los Angeles, Calif., was recently incorporated for $500,000.

The William Ellis Cement Products Company has recently started a concrete products business in Morristown, Pa., with a daily output of about 2,500 blocks a day.

No more asphalt, brick, or creosote block pavements are to be laid in Chicago after this fall, according to an announcement made by the president of the board of local improvements recently. Reinforced concrete alone is to be used, because, according to the board, "it can be laid for from sixty to seventy per cent of the cost of asphalt, it does not wave or give to ruts, and it wears longer, is better and more easily cleaned."

The world's largest airplane hangar, made of steel and concrete, has recently been completed at Orly, France. It will measure about two hundred feet high and three hundred feet long, and will be used for dirigibles now under construction.

Chicago is investigating the feasibility of substituting concrete for brick in the construction of its catch basins. According to a statement issued by the mayor, the cost of brick basins is between $100 and $105, while they may be constructed of more durable concrete for $69.

The Raymond Concrete Pile Company of New York announces the opening of a Pacific Coast office in the Washington Building, Los Angeles, Calif. Mr. O. C. Struthers, formerly with Pratt & Thompson, general contractors, Kansas City, will be in charge of the new office.

Cement and Engineering News has received an invitation to attend the launching of the new steamer "John W. Boardman" at the Toledo shipbuilding yards, Toledo, Ohio, September 6th. The steamer is owned by the Huron Portland Cement Company, 1325 Ford Building, Detroit, Mich., and will engage exclusively in transporting the product of that company.

Adjust Road Rates

Washington, August 28. — Decisions have been rendered by the Interstate Commerce Commission in cases brought by the Acme Cement Plaster Company and the Standard Portland Cement Company. The Acme Cement Plaster Company was awarded reparation for overcharges on shipments of plaster. The Standard Portland Cement Company was awarded reparation on shipments of coal.

In the case of the Acme Cement Plaster Company against the Pere Marquette railroad it was found that overcharges were made in making combinations of separately established commodity rates applying to carload shipments of plaster from Grand Rapids, Mich., to Lynch, Ky., via Louisville, Ky.

Findings in the Acme Cement Plaster Company were as follows: "1. Tariff containing rule providing that where shipments move on combinations of separately established commodity rates, instead of increasing each factor of such combinations on June 25, 1918, the applicable rates will be determined by adding a single increase, found to be applicable on the lines and upon the character of traffic designated therein. Shipments found overcharged accordingly, and reparation awarded. Former reports 59 I. C. C., 411, and 62 I. C. C., 119, reversed.

"2. Finding in former report, 62 I. C. C., 119, that the applicable rates were not unreasonable or otherwise unlawful, in so far as it relates to shipments not affected by the combination rule described, affirmed."

In the case of the Standard Portland Cement Company the commission held that rates on coal in carloads shipped during federal control from Dora, Empire, Townley and Carbon Hill, Alabama, to Leeds, Alabama, on the St. Louis-San Francisco and Southern were not unreasonable. Those over the St. Louis-San Francisco and Central of Georgia were found unreasonable and reparation was awarded. The complainant manufactures cement at Leeds, Alabama, and contended that the intrastate rates on coal in carloads shipped from Dora, Empire, and Carbon Hill to Leeds between June 25, 1918, and February 11, 1919, were unjust and unreasonable.

The Atlas Powder Company is now making a non-freezing explosive called Ammite which, according to the manufacturers, retains all of the advantages of dynamite in strength, velocity, water resistance, sensitiveness, and stability, and has the additional advantage of being non-freezing and not causing headaches when handled. The Atlas people call it an "all-year-round" explosive.

Cement
and
Engineering News

Vol. 35 CHICAGO, OCTOBER, 1923 No 10.

Building Cement Mills of "Blue Sky"

The fact that a great many cement mills have recently been unable to supply the demand for their product has led to a growth of "blue sky schemes" in the fake promotion of additional mills for supplying the so-called excessive demand.

Those who are engaged in gathering the type of news needed for a journal of this kind are most readily aware of the ever-increasing number of quacks who take care of present economic conditions to fleece the innocent public of its money. Each month several notices are received that a new cement plant is being proposed for some location or other, that some self-styled "big financier" has taken advantage of the proposal, and that he has organized the company and has started selling stock for it. The very fact that a big demand for cement exists is an assurance in itself that profits will be handsome.

But in the majority of cases actual production never starts. The money is all gathered in, and the "financier" disappears with the funds. Perhaps he has done the unwise thing. Perhaps a demand did exist, and perhaps he had selected a site for his proposed mill which offered advantages both in the supply of raw materials and in accessibility to the market. But he has not surveyed those facts. He knows that he has gotten together some capital and that he can get away with all of it, so drops the whole idea of ever actually starting a plant.

Such men have evidently diverted their efforts from oil fields to cement plants. Oil always offered a risky investment because of the fact that the money had to be advanced to find out whether it existed or not. Quacks, however, took advantage of the fact that the public knew that many men had gotten rich from a small investment in new fields, and consequently promoted fake companies here and there, offering splendid inducements, but in reality consisting of nothing else but mere graft. We all know too of the Florida real estate development promoters, who sold land which had, upon investigation, to be measured in gallons instead of in acres. They were giving the exact locations of building sites which surveys found to be merely strips of wide blue ocean.

Now that class of men are trying to exploit cement. Their efforts in this behalf must be stopped immediately by anyone who comes in contact with them. The cement industry is a legitimate, well-grounded business, run, on the whole, by far-seeing, substantial business men. The whole industry will be seriously handicapped if mere stock selling propositions are not stopped and stopped pretty quickly.

If an investor is caught in the net of a fake promoter, he will never take the chance on investing in a proposition which may in reality be sterling. As soon as this condition comes about the legitimate growth of the cement industry is severely impaired.

It might be well to take a look at the facts and conditions which make the cement trade a lucrative field for fake exploiters. Cement and its uses are only about fifty years old in the United States, but today the industry ranks sixth among all enterprises in the nation. Its growth has been marvelous, because cement is a product which the public must have if it is to advance with its present long strides. Cement has in a remarkably short space of time risen from obscurity to practically the kingship of modern building materials.

Cement manufacturers, realizing the worth of their product, have spent millions educating the public as to its multitudinous uses. The press, leaflets, and various other forms of publicity have been employed, until today the public does not know what it would do if it were not for the existence of cement. Cement has become practically an every-day necessity in the life of the average American. On the farm it is used in building satisfactory, permanent and more artistic things, from watering troughs to silos. In the city its employment is yet more extensive. It forms the basis for practically every modern skyscraper, it is the thing which makes beautiful bridges and roads possible—it is, in fact, practically indispensable. The demand for this high class building product is not only insistent, but is daily growing.

It is such a field that the investor, both small and large, likes to enter. He knows that the demand for the manufactured product exists and is likely to continue to grow. He knows that entrance into such an industry, if properly managed, is bound to be profitable. Cement is no novelty. It is a permanent necessity. The fact that cement mills in some localities cannot always supply the demand, leads to the assumption that the starting of a new enterprise would lead to still greater profits. Consequently the field looks ripe for lucrative investment.

Now the investment shark enters the scene with prospects for a thriving business. He has his location all picked ready to meet the prices of his competitors, and all he needs is a little money. He is convinced of the fact that he, and all the rest of the people who will invest their money in his enterprise, will some day be rich. He paints vivid pictures. And the result is that the public buys his stock which, like the German mark, is worth only the money paid for old paper. Its actual value is nothing.

The quack has sold the public the blue sky, and as a result has, if he evades the governmental authorities, himself become rich. But no cement mill ever springs into existence because of his promotion. The public has been swindled, and the public consciously avoids another investment in a cement mill and unconsciously harbors ill feeling against the product of the industry, cement.

Teaching Cement Use by Example

Exhibits, Satisfying "Show Me" Attitude of Public, Would Help Materially in Encouraging the Proper Use of Concrete as Material of Construction

A wholesale shoe salesman does not sell from a catalogue, but rather shows actual samples of his shoes to the prospective buyer. The candy salesman not only shows the merchant his product but also insists that he taste it. As a matter of fact, no matter what he is selling, a salesman always recognizes the value of samples in cultivating desire for any particular commodity. Booklets, pamphlets, pictures, or catalogues are used only when samples cannot be carried. Now why can't that same sales psychology be used in the case of cement?

Cement manufacturers each year spend great sums of money in educating the public to the more extensive use of their product. Great stores of information have been assembled by experts in charge of the work, and each year that information is meted out to the buying public in the form of paid advertisements, booklets, and even motion picture films. That that work has been effective cannot be denied. A mere look at the production figures of Portland cement for the past few years will convince the most skeptical. One of the best publicity methods has, however, not been cultivated along with the growth of the industry. Museums and exhibits have not been provided.

A comprehensive and complete permanently located museum, situated perhaps in Chicago or in some other readily accessible point, would prove extremely valuable. The western metropolis would no doubt be found to be the most desirable location because of the vast number of people who come there each year. It is preeminently the main center from which business radii shoot out in every direction.

The exhibit could be made interesting as well as instructive. It could depict the processes through which cement must go from the time the ingredients are dug out of the earth until the time it forms a part of a finished structure. A cement mill could be constructed in minature. Quarrying and digging operations could be shown, and the materials could be taken straight through miniature machinery to completion. An exhibit on the bagging of cement would be in place here. Then specimens of concrete made by various mixes and with various ingredients could be shown. Methods of testing could be depicted. Finally, there should be a complete exhibit showing the manufacture and use of the thousands of products made by the use of the king of building materials, cement.

Such a museum would combat the general ignorance of the public as to the wide field for the use of cement in the home and in industry. It would be stronger than a written or oral message. It would be more powerful than pictures. It would actually show the "show me" public all of the facts. "Seeing is believing" would spend its force in behalf of the superiorities of concrete construction. Not only that, but use would be made of the most valuable sales medium in our possession today, the psychology of suggestion. If one man on the street starts looking skyward, most of the other passersby will begin doing likewise. If one man in a church coughs there ensues a general clearing of throats. If Mr. Public finds that someone else has made use of concrete in a particular way, he too will be in favor of it as a construction material. The greater the number of exhibits, the greater the use of concrete by those who have occasion to see the museum.

We hear a lot about the grandeur of Niagara and about the splendor of Alpine scenery, but pictures of those things merely incite in us the desire actually to go to see them. We are not satisfied with words or photography; we want actuality and reality. Bearing that fact in mind, it can readily be seen that an exhibit of cement and concrete products could do more good missionary work in a day than booklets can do in a week. Such an exhibit would close the contract for those products; it would be the "sign on the dotted line" expert.

To the man now in the concrete industry, as well as to the one contemplating entering it, the museum would be extremely valuable. Suppose a man starts out today to build or improve a plant. In order to determine his most advisable processes and purchases, he must, if he intends surveying the field at all thoroughly, set out on a tour of inspection of plants scattered all over the country or get his information from testimonials found in various catalogues. In either event his survey is difficult, possibly costly, and probably not satisfactory. With all information concentrated in a central museum, however, this same man could in one visit gain more information of the right sort than he could otherwise obtain by the expenditure of a great deal more energy and money. To such a man the exhibit would no doubt prove to be of great value.

To add to the effectiveness of the scheme, travelling exhibits, taken to the various state and county fairs, would also prove worth while. There great crowds congregate to look at the newest developments of civilization. Can we admit that portland cement should not be well represented at such an exposition? These exhibits should, like the main one, be in charge of trained experts who are able and willing courteously to give the public the interesting information which it wants. It must be understood, of course, that the "travelling show" would be much smaller than the "main tent," but it would nevertheless convey its message.

Our brethren in Britain have employed the combination of exhibits to good advantage for some time. America could well follow the example of the mother country in this regard. It would not only prove profitable to the industry, but it might also rid us of a lot of amateurs and quacks who disregard quality entirely and strive solely for the biggest present profit obtainable. These men are not working for the good of the industry, but are rather selfishly working to its detriment.

After all, it must be remembered that most of us have the attributes which are said to characterize the gentlemen from Missouri—"You have to show us." Someone has advised that we should believe nothing that we hear and only half of what we see. Whether that is good advice or not, most of us unconsciously follow it. Why not recognize it as a public rule of action in industry? Why not capitalize on it? Why not show the people? Let us give the ever curious public exhibits showing in a practical way the marvels of concrete in its multiplicity of uses. Let us supplement our present voluminous literature by exhibits, silent salesmen with proven ability.

How Concrete Is Advertised in Great Britain

Collective Advertising Not as Fully Advanced in England as in America —Concrete Utilities Bureau Probably Best Organized of the Group

By W. Hamilton Gordon, London Correspondent

Collective advertising of its products by an industry is not carried on in Britain to the extent it is in the United States, though as a practice it is on the increase. By this, be it understood, I refer to advertising in the national press, advertising of a product or products in a general manner without specific reference to any particular brand of goods. A notable example of such collective advertising in Britain, advertising which is going on at the present moment, is that done by the association of paint and varnish manufacturers, who are, through the daily papers, imploring the public "to paint more and save more." Another is the campaign being carried through by fruit merchants, and importers of bananas, in particular. In addition to these, and one or two other industries, there are a couple which are about to take the plunge. These are the printers, who mean to adopt as their slogan "use more print and make more profit," and the bakers who are going to run a special campaign with the intention of getting the public to eat more bread. But in all the above industries the advertising is being done through advertisements in the press alone.

The concrete and cement industries have approached the matter from quite a different angle. Though realizing the value of press advertising under some circumstances they have not relied on this to any great extent. Their program has been much more ambitious and better thought out. It is comprehensive and designed to cover all activities in which concrete may play a part. Of all collective advertising schemes in operation in Britain it seems to the writer to be far and away the best.

The way the scheme functions is as follows: There has been brought into being for the purpose of furthering the scheme an organization known as the Concrete Utilities Bureau, the sole object of which is to spread knowledge regarding the material and popularize its use by every means possible. This organization has offices in the very heart of the City of London, at Great St. Helens. Additional premises in Grosvenor Road, somewhere in the neighborhood of the United States Embassy, are used solely for a permanent exhibition of concrete products, which is divided into indoor and outdoor sections and where more than 300 exhibits to illustrate the many uses to which concrete may now be put are classified under the various interests, such as estate, farm and home, the building industry, municipalities and other public bodies, railways, ornamental products, and miscellaneous. Incidentally, it may be mentioned here that his exhibition has attracted much attention and has drawn interested visitors from all parts of the world.

Publishes Many Pamphlets

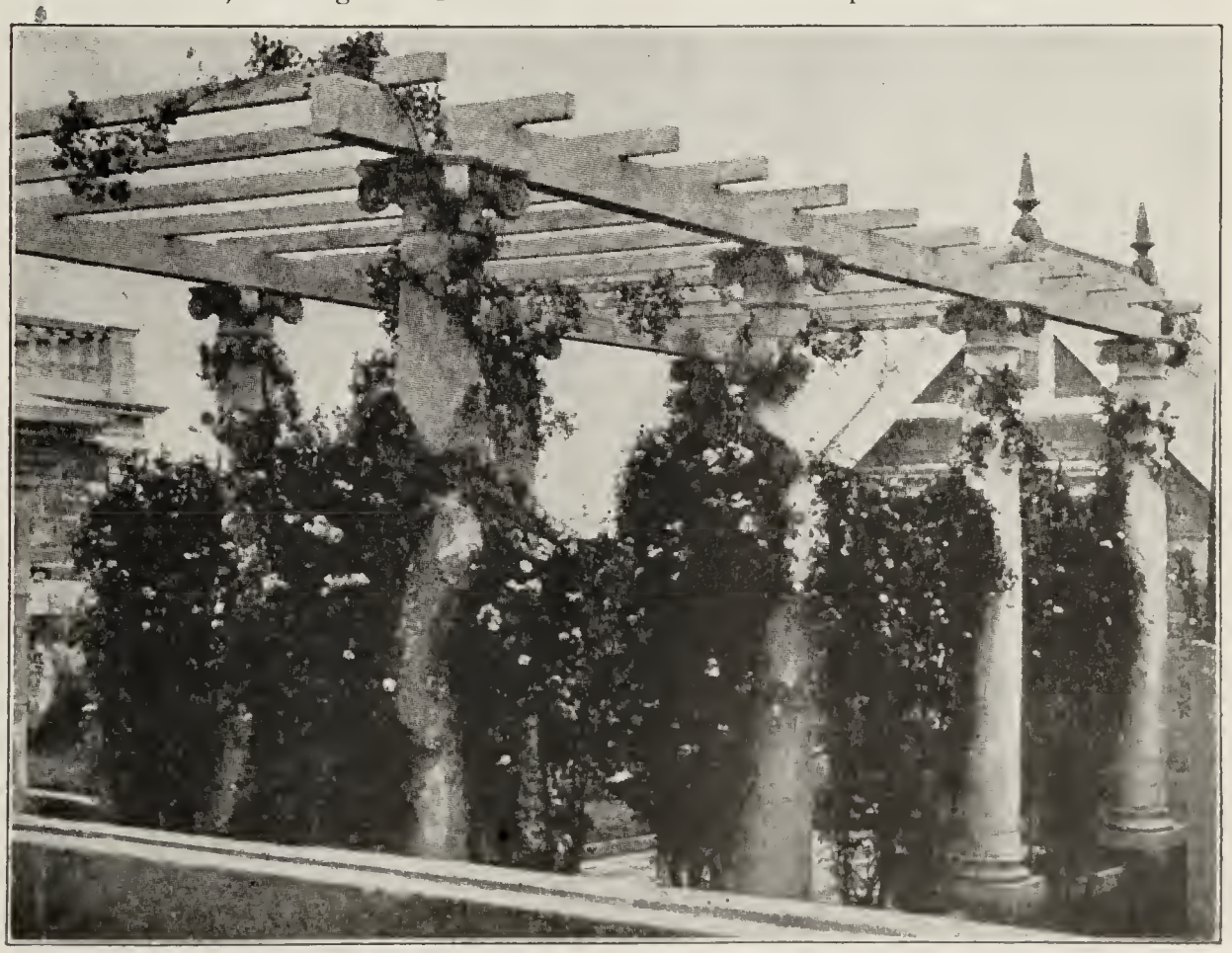
The Concrete Utilities Bureau is many-sided in its activities. First of all it issues quite a number of publications. Sixteen pamphlets claim one's attention, pamphlets not intended for the highly technical constructional mind, but with contents of such a character that they can be fully grasped by the agriculturist, the handy man, or the small builder who has had but little experience in dealing with concrete construction. I am giving some of the titles of these pamphlets because these are self-explanatory and give a very excellent idea of what a wide field is covered: "Concrete as a Unique Building Material and Substitute for Timber," is the first; "Concrete, How It Is Made," the second. This is a very useful little book with full directions for the practical man who has had no previous experience with the substance, containing sections on cement, sands, aggregates of various kinds, mixing, proportioning, placing, etc., all written so as to be easily understood. Number three is devoted to concrete tanks and cisterns, and four to paths and pavements, curbs and gutters. The next one gives details of how to make concrete fences, gateposts, and walls, whilst six deals with concrete floors, feeding floors and footpaths. Number seven contains information regarding poultry houses and piggeries of concrete and the one following goes into the question of farm buildings in general. We then have in succession: "Concrete Troughs and Wells," "Concrete Greenhouses, Hotbeds and Root Cellars," "Concrete in the Home," and "How to Make and Use Concrete Blocks." Number thirteen, a lucky number in this case, is a larger pamphlet dealing with the manifold uses of concrete for farm and estate, home and garden, town and country and road and railway. It summarizes to some extent the information given in the pamphlets which precede it. The next two pamphlets deal with the artistic possibilities of concrete, and specifications for concrete roads. Number sixteen, the last of the series, deals with the permanent exhibition already referred to. Now, all these pamphlets are tastefully produced, fully illustrated with blocks from actual photographs and with scale diagrams, and filled with a mass of detailed information as to how the various objects treated of can be made, the latter written from the point of view of the non-expert. They are certainly worth good money to anyone interested in the subject but the Concrete Utilities Bureau is only too pleased to send all or any of them on request to any applicant who is likely to become a concrete user.

Further activities of the Bureau have been the publication of two informative handbooks, of several hundred pages each, one of which deals with concrete roads and the other with concrete cottages and farm buildings. These contain many illustrations and diagrams and are crammed with information likely to be useful to persons interested in the

Foreword

Americans, fully aware of the effectiveness of the Portland Cement Association in its endeavors to promote the use of concrete in this country, will no doubt be interested in reading an account of Great Britain's similar organization. Mr. Gordon, in the following article, describes that Bureau and its activities in a most interesting manner.

THE EDITOR.



Concrete rose pergola exhibited at the Royal Agricultural Society's Show at Bristol.

subject. They are written in partly technical vein and partly popular, thus being of use to both the expert and the novice.

A monthly technical journal, entitled "Concrete and Constructional Engineering" is published by Concrete Publications, Ltd., and is intended to appeal to engineers, architects, surveyors, contractors and all persons interested in cement, concrete, reinforced concrete, fire-resisting construction and structural steel. Working in the interests of the industry as a whole and having no particular ax to grind—beyond the very important one of increasing the use of concrete as a whole, this journal can afford to be independent and impartial. Loaded with matter of interest to the expert and well-supported on the advertising side by the industry, this piece of enterprise would appear to be remunerative, both directly and indirectly.

This finishes the tale of the publishing activities of the Bureau and Concrete Publications, Ltd., and now we come to the consideration of what is being done by direct and indirect advertising.

$250,000,000 for Roads

The Bureau indulges in a considerable amount of advertising in the public press chiefly with a view to impressing the agricultural interests. Much advertising is also done to surveyors and contractors in the technical journals in addition to that directed to farmers in their special class publications. In these displayed advertisements an endeavor is always made to attain a topical note. Recently, of example, the British Minister of Transports made the announcement that it was proposed to spend the sum of $250,000,000 on road constructions and repairs. Advantage of this statement was taken to point out to the surveyors, who would have to make the recommendations which would lead the spending of this money on the sections of road under their control, the manifold advantages of the concrete road. The question of new arterial roads is one which bulks very large in Britain at present, not only on account of the pressing need for these owing to the large increase of motor transport for freight and passengers, but also on account of the unemployed, who number at present somewhere in the region of a million and a quarter. The Government has either to keep these unfortunates in idleness on the "dole" (weekly unemployment allowance) or set the stronger ones capable of such labor busy on public works. Of these public works new roads and the repair of existing ones form an important part. The Bureau has taken advantage of this to show by charts displayed in advertisements how the number of concrete roads has increased from none in 1912 to just over 200 ten years later. There is still much more money to be spent in this way because we are dismally contemplating a fourth winter of unemployment which seems likely to be little better than the past one. The Government will have to spend a large amount more on roads yet and the Concrete Utilities Bureau is therefore using every endeavor to make the local authorities appreciate the concrete road at its true value.

So much for direct advertising in the press. A good deal of indirect advertising is done in the form of "reader" advertisements and many little paragraphs are sent to the provincial papers in the country districts containing practical hints on concrete constructions suitable for farmers, small-holders, etc. As these are technical and do not puff

General view of the open-air section of the Concrete Utilities Bureau's Permament Exhibition.

any particular product the average newspaper editor in the country is only too glad to make use of them. He thinks he is getting something for which he gives nothing in exchange and his heart is gladdened exceedingly at the thought. The Bureau is also pleased. The farmer gets some practical suggestions. Thus all parties are benefited.

Owing to its independent position in booming the product of a whole industry and not a particular brand of product the Bureau is in a strong position in its dealings with the technical press. It is able to supply articles to the class journals dealing with concrete construction and cognate subjects which are free from bias and possess great technical value. Articles of this kind which I have seen include one supplied to a farming paper on the making of a concrete silo and a couple of articles on concrete roads written for a surveyors' journal. Much other interesting matter of the kind could be instanced. In fact, the Bureau will undertake to supply to any technical paper an article regarding the use of concrete in the particular industry the journal is connected with. In many such cases reprints of the articles are made and circulated through the mail to whoever is likely to be interested. If it is a brewing subject the reprints are sent to all the brewers in the country; if it is a question of roads all the surveyors get a copy; if building, all contractors and architects receive one. Some of these articles are quite novel in their ideas. I have at my side as I write a reprint of one on concrete lawn tennis courts and how to construct them with an illustration of players using an actual court constructed in Berkshire laid in accordance with the specification given in the article. It might be mentioned here that concrete courts are much more of a rarity in this country than they are in the United States.

Corner of Interior of Permanent Exhibition showing section of concrete slab road in foreground.

Prominent in Exhibits

In addition to its own permanent exhibition in London, already mentioned, the Bureau undertakes a good deal of exhibition work. The permanent exhibition affords an opportunity for inspecting the various structures and articles which can be made from concrete so that those interested can acquire a knowledge of the multiplicity of uses to which it can be put. However, at some of the country agricultural exhibitions or "shows," as they are usually termed, which are held at all farming centers each year, it has been found useful to give practical demonstrations of how concrete is made and how construction is carried out with it. The farmers have greatly appreciated these demonstrations on account of their practical value. The demonstrators travel round the country, and go on from one county show to the next.

The Bureau has also exhibited at various other exhibitions here from time to time and is to make a big effort at the British Empire Exhibition which is to be held at Wembley, just outside London, next year. This Exhibition, which is officially supported by the Government, is intended to give some idea of the products of the whole Empire, whether they be natural or manufactured, and is the biggest thing in the way of exhibitions yet attempted.

Nor is the educational side of things neglected by the Bureau. Series of lectures on concrete, its manufacture and uses, are delivered by experts at the universities and colleges. One series has just been completed, for example, in connection with the agricultural course at that ancient seat of learning, Oxford University. None of the other universities or colleges is neglected where opportunity is granted by the nature of the curriculum. Lectures so given are illustrated with lantern slides.

In common with some other industries in this country, the use of the cinematograph for propaganda purposes has been taken up in the case of concrete. Two films have been produced, one of which is technical in its entirety and only interesting to concrete experts, whilst the other is of a popular character and designed to interest the public. The latter is shown at picture palaces and the former is used where the audience is of such a character that it can appreciate the intricate operations depicted.

As is natural the Bureau pays great attention to the needs of the agricultural industry. The farmer may not be a large user of concrete when compared with the contractor or surveyor but, taken in the bulk, he can absorb a considerable quantity, and it is a question of keeping on pointing out to him new uses to which it can be put. He is usually slow in taking up new ideas but when once he becomes infected with the concrete virus there are a great many ways in which he can use the product. Advertising, as outlined, is used to get him to commence using concrete and where he has any difficulty in forming a plan of action the Bureau will send a representative to advise him without fee or payment. If there is any further difficulty arising from the initiation of the work the Bureau will send a practical man down to the farm or estate to set things going, to show the correct fashion of making the various constructions, even down to the best way of mixing the concrete, if necessary. This again is done entirely free of charge.

Of course, at the present time, con-

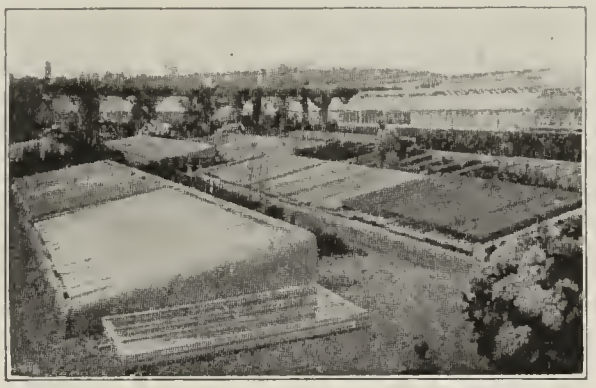
crete roads are the development which is attracting most attention, for, as previously explained, a great number of new roads are being constructed. Here, as is only natural, the experts of the Bureau can be of the greatest assistance. Where a new concrete road is to be built a couple of experts will be sent to give advice to the surveyors under whose orders the road is being constructed. In Britain the mileage of concrete roads is not recorded and, of course, the number of such roads is far and away inferior to the number in the United States chiefly, of course, because there are such a vast number more of power-driven vehicles in your country. That the number of concrete roads is in an increasing ratio is clearly shown, however, by the following figures:

Number of concrete roads in Britain
at the close of the year 1919..... 25
1920..... 59
1921.....107
1922.....201
Number at end of July, 1923.....290

It will therefore be seen that, in very approximate figures, the increase per year has been about 100 per cent.

Gives Free Advice

The final utility of the Bureau which has to be referred to is the giving of advice by its investigation department. In this experts are constantly employed in experimenting with concrete to ascertain new uses to which it can be put in various industries and to make tests for large users and others. A great many such tests are made. If a surveyor is about to put down a new road or erect any kind of building, or if a contractor is in any doubt, they can send specimens



Propaganda for the horticulturist. Concrete garden frames.

of the aggregate it is proposed to use to the Bureau and get a comprehensive verdict on its suitability together with advice as to how it can be improved if this is requisite. Nor is this advisory work confined to building or road-constructional operations. There is not a single user of concrete in any shape or form, actual or prospective, who will not find in the Bureau solution of any difficulties with which he is, or may be, faced.

It will be seen from this account what good work is being done by the manufacturers in England, through the medium of the Concrete Utilities Bureau, to push to the utmost the use of concrete. A great deal has already been accomplished and the employment of this material increases rapidly every year. Like rubber, new uses are continually being thought out for it and like the raw rubber industry the propaganda for it is conducted in a most intelligent manner. It is a fortunate industry in turning out what is more or less a standardized product because, for this reason, collective advertising in its many forms can be carried out smoothly with no risk of favoring one manufacturer at the expense of another. It is also a fortunate industry in that it has organized such an ideal advertising service. Much has been done to popularize the use of concrete in Great Britain and the Concrete Utilities Bureau has played a great part in helping along the demand. Much remains to be done yet, concrete must be popularized still further, and one can safely wager that the Concrete Utilities Bureau will earn a greater share of credit for what it will accomplish in the future than even for what it has done up till to-day. Self-help is a great asset in an industry when carried out on methodical and intelligent lines.

Quarry Accidents for 1921 Decrease

"In 1921 the quarry industry in the United States showed fewer fatal accidents to employees and slightly more nonfatal injuries than in 1920," says the government survey of quarry accidents in the United States during the calendar year 1921, recently issued as Technical Paper 329, copies of which may be obtained from the Superintendent of Documents in Washington. "According to reports from operating companies to the Bureau of Mines, the fatality rate declined from 2.31 per thousand employees in 1920 to 2 per thousand in 1921, and the injury rate rose from 145.51 to 174.54, these rates being based upon a standard of 300 working days per year.

"Reports from 1,764 operators showed 77,185 employees, who worked 17,987,547 shifts, an average of 233 work days per man. As compared with 1920, these figures indicate an increase of 47 operating companies, a loss of 5,139,101 shifts, and a reduction of 34 workdays per man.

"Operations inside the quarries showed 45,292 employees, 10,824,541 shifts, and 220 average days per man; work at crushers and rock-dressing plants showed 27,893 employees, 7,163,006 shifts, and 257 workdays per man. Each of these figures represent a reduction as compared with 1920.

"Accidents during the year resulted in the death of 120 men and the injury of 10,465, as compared with 178 killed and 11,217 injured in 1920.

"The accident rates for quarries producing stone for building or monumental work were 3.23 killed and 104.24 injured per thousand men employed, as compared with 1.22 killed and 152.37 injured in 1920; the rates for quarries where the stone is crushed were 3.40 killed and 230.51 injured per thousand employees, as compared with 2.66 killed and 213.19 injured in 1920. At the outside plants at the building-stone quarries the rates were 0.38 killed and 158.90 injured as compared with 0.95 killed and 126.30 injured; at crushers and cement mills the rates were 1.28 killed and 177.39 injured, as compared with 1.73 killed and 183.77 injured in 1920.

"Of the 10,585 accidents at all quarries during the year, 1.13 per cent were fatal, 0.09 per cent resulted in permanent total disability, 3.12 in permanent partial disability, 17.91 per cent in temparary disability of more than 14 days, and 77.75 per cent in disability not exceeding 14 days but more than the remainder of the shift on which the accident ocurred.

Limestone Quarries

"Limestone quarries constitute the largest branch of the quarry industry, usually employing about half of all workers in the United States. Companies producing limestone in 1921 employed 39,551 men, 8 per cent less than in 1920. The total working time for all employees was 8,819,813 shifts, each man averaging 223 workdays during the year, a loss of 36 days per man from the year before.

"Accidents to employees resulted in 58 deaths and 5,248 injuries, of 1.97 fatalities and 178.51 injuries per thousand 300-day workers, the former being smaller and the latter being larger than the corresponding rate for the preceding year.

"Most of the injuries inside the quarries were caused by handling rock at face, flying objects, haulage, falls or slides of rock or overburden, machinery, falling objects, and falls of persons. At the outside plants the accidents resulted mainly from machinery, flying objects, falling objects, falls of persons, hand tools, and haulage.

"The operators' reports showed that 21.3 per cent of the men working inside the pits were employed 8 hours per day, 23.4 per cent 9 hours, and 43.8 per cent 10 hours. Of the employees at the outside plants, 9 per cent worked 8 hours per day, 22.5 per cent 9 hours, and 42.9 per cent 10 hours

Cement-Rock Quarries

"Reports from 70 companies operating cement-rock quarries showed that they employed 10,815 men, of whom 3,432 worked in and about the pits proper, and 7,383 worked at the outside plants and mills. The men averaged 290 workdays during the year, and worked an aggregate of 3,137,789 shifts. The working time represents a loss of 31 days per man as compared with 1920, while the total number of shifts indicates a loss of 26 per cent.

"Accidents killed 20 and injured 2,233 men, or 1.91 killed and 213.50 injured per 1,000 employees (300-day workers). For 1920 the corresponding rates were 2.75 killed and 182.49 injured. Of the 20 fatalities, 5 occurred in California, 3 in Illinois, and 2 each in New York and Pennsylvania.

"The leading causes of accidents inside the quarries were haulage equipment, falls or slides of rock, flying objects, machinery, falling objects, handling rock, and falls of persons. Most of the injuries to employees at the outside plants were due to falling objects, machinery, flying objects, falls of persons, hand tools, and burns.

"The established length of the working day at cement-rock quarries was for men inside the pits, 8 hours for 10.7 per cent of the workers, 9 hours for 19.8 per cent, and 10 hours for 54 per cent. At the outside plants and mills, 17.7 per cent of the men were employed on the basis of 8 hours per day, 0.7 per cent 9 hours, 7.7 per cent 10 hours, and 19.5 per cent 12 hours."

Left—A general view of the plant of the Monon Crushed Stone Company from the quarry floor. Right—Front view of the plant. Note that both trucks and railroad cars may here be loaded from the storage bins.

A Prosperous Indiana Stone Plant

By a Staff Member

In 1909 a certain Herman H. Evans established the Monon Crushed Stone Company at a point about three-quarters of a mile south of the little town of Monon, Ind., locating the new venture right on the Monon main line between Louisville and Chicago. After five years of operation, the plant was moved across the road to a newer, finer, and more extensive source of rock, and there it has continued to grow until today it is one of the most modern, efficient, money-making plants in that section of the country.

The quality of stone found in this quarry is called Niagara limestone. Its product has a decided bluish cast, the only one of its kind being quarried in the state. The character of the stone is somewhat freakish, as it has been found to change its characteristics entirely within an area of a half mile. It is found on test to be within thirteen-hundredths of one per cent as hard as the hardest limestone the government has tested. The material has been found of exceptional value as coarse aggregate in concrete work and as the repairing of roads, as its extreme hardness makes for lasting qualities.

Three blast hole drills made by the Loomis Machine Company of Tiffin, Ohio, prepare the holes for Grasselli explosives. A railroad type Marion shovel of sixty tons capacity and a caterpillar type Marion shovel of thirty-seven tons capacity load the stone from the fifty foot quarry face into Austin 2½ yard cars. Three dinkies are used, one being a Davenport, another an H. C. Porter, and the third a Baldwin. The cars are pulled to the incline leading to the plant proper, into which they are pulled by Allis-Chalmers hoisting machinery. The material is dumped directly into a No. 18 Allis-Chalmers crusher, which has a capacity of 5,000 tons a day. From here the material is carried by means of a Steven Adamson conveyor to the scalping screen, from there to three No. 3 Austin crushers, then through a Kennedy gearless, a No. 5 Austin, a No. 8 Austin, through Allis-Chalmers 16x42 rolls, and then to the sizing screens. From here the nine different sizes are sent directly to their bins, from which they may be loaded either into trucks for local orders or into cars for more distant trade.

Power for the entire plant is made right on the grounds. Three 150 h. p. HRT boilers, furnished by the Bass Machine and Foundry Company, furnish the steam for a 500 h. p. driving unit, made by the Bates Machine Company of Joliet, Ill. All gears, pulleys, shaftings and hangers—in fact all of the power transmission equipment used —were furnished by the W. A. Jones Foundry and Machine Company of Chicago. With reference to this equipment, Mr. George H. Balfe, general manager of the plant, said, "That equipment is especially good. It is well made and is true, so that we never have any trouble with it." Mr. Balfe added that a good part of the transmission equipment has been in the plant since its beginning and that few replacements were necessary. The material was so satisfactory, in fact, that, when

Modern equipment is used from the time the stone is taken from the quarry until it is hauled away.

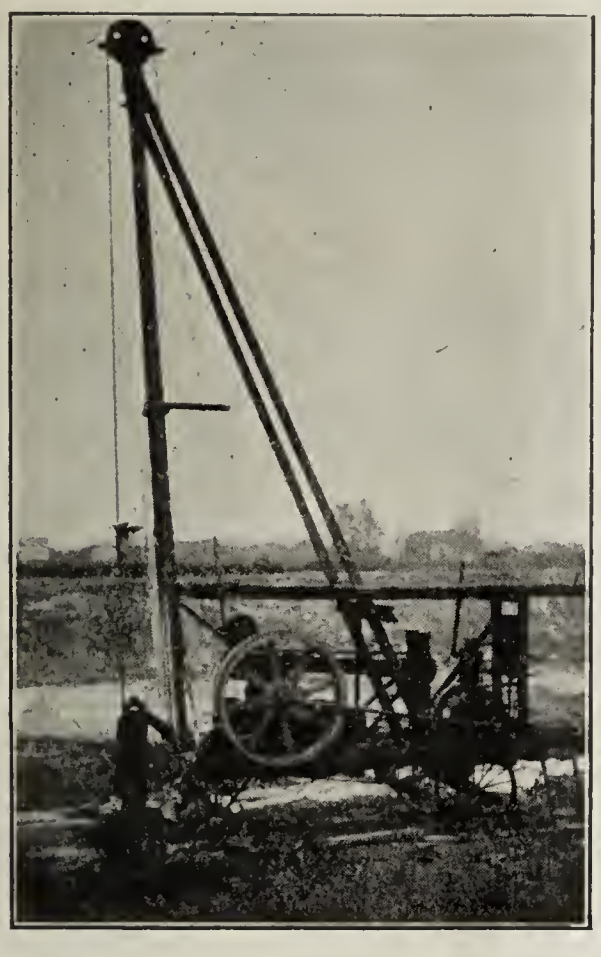
At the right—A Browning Crane with a 1½ yard clamshell bucket loading stone from the storage piles onto cars.

Lower left—Thirty-seven ton caterpillar type Marion steam shovel in action, loading stone into Austin 2½ yard cars.

Lower right—Thirty-seven ton railroad type Marion steam shovel taking care of the other end of the quarry.

recently enlarging the plant, he again placed his order with the Jones organization.

When the buying season is dull, the material is stored in piles nearby, being loaded into cars when purchases are more brisk by a 20-ton Browning crane equipped with



Three blast hole drills made by the Loomis Machine Company are kept busy preparing the holes for Grasselli explosives.

a 1½ yard clamshell, which has a loading capacity of from 75 to 100 tons an hour. Ingersoll-Rand air compressors keep the quarry bottom dry.

The plant, with its recent improvements, is now producing in excess of 300,000 tons of material each year. Plans are now being formulated, however, gradually to double that output, as the market is good and the company has at its disposal about 120 more acres of material requiring little or no stripping for exposure.

Mr. George H. Balfe, president of the Indiana Crushed Stone Association, is president of this $150,000 company. Mrs. Grace Evans, widow of Mr. Herman Evans, founder of the company, is secretary and treasurer. Mrs. Evans has mastered the stone business thoroughly and is always on hand at the office to transact its business and to give expert advice as to the use of the product. Mr. William B. Newman is in charge of sales, while Mr. John McGuire is superintendent of the plant.

According to Mr. Balfe, the outlook for future business is exceptionally good. Roads, of course, always absorb quite a little of the material, but with the farmer becoming more fully educated as to the uses of concrete in agriculture, the market for crushed stone as an aggregate is fast assuming large proportions. As a matter of fact, he is now planning on enlarging the plant in every way, including in his budget the installation of standard gauge railway equipment instead of the present narrow gauge dinkey system.

At the present time, of course, the plant has a normal rating of 1,000 tons per day, but the addition of 1,000 feet of track for ground storage on both sides of the installation makes a 50 per cent added shipping capacity possible during the busy season.

Gravel Roads Hard on Auto Tires

"If we had concrete surfaces to drive upon we could pay a tire tax of 67 per cent and still spend no more money for tires than is required for our present road surfaces," says Highway Engineer H. E. Phelps of the State College of Washington Engineering College, discussing the effect road surfaces, poor or good, have on the cost of running autos and hauling loads.

"Within the last year there has been an organized effort made to reduce taxes, which are generally agreed to be too high all over the country," he continues. "In many places this effort to reduce taxes has taken the form of an assault upon the taxes being levied for good roads."

He points out how experiments have proven how a gallon of gasoline is needed to haul one ton 14 miles on earth roads, 21 miles on gravel, and 31 on concrete.

"It is interesting to translate these figures into the cost of gasoline per mile of travel for the average automobile," he continues. "Taking the weight of an automobile as 1.4 tons, with gasoline costing 20c a gallon, each mile of travel would cost 2c for gas on earth roads, a cent and a third on gravel, and only ninety one hundredths of one cent on concrete. In other words, when the car reaches the end of the concrete and starts down a gravel surface, the extra gasoline required costs as much as a tax of 6 2-3c per gallon. And when it reaches the end of the gravel and starts down the average poor earth road, an added cost of 10c per gallon is the traveler's tax caused by the poor road.

"Thus these figures prove that our poor roads place a gasoline tax upon us three to eight times as great as the tax the legislature placed on gasoline for good roads. And this poor road tax has the added disadvantage that we receive no returns from its expenditure.

"This gasoline tax of 6c to 10c a gallon placed upon us by poor roads is not the only tax we pay to poor roads. Definite figures are lacking but experience on Palouse gravel indicates that such roads are extremely hard on tires. They also place upon us taxes of unknown magnitude because of the added repairs required, and the shorter life of automobiles used upon poor roads as compared with those run on good road surfaces.

"Estimates made by automobile dealers show taxes to be just as high as the poor road gasoline tax and the poor road tire tax. But neglecting them entirely, we still have such large taxes to pay to poor roads that we should have no hesitation in continuing our good roads taxes for the purpose of abolishing our much larger poor road taxes as rapidly as possible."

Mill Earnings Rise

WASHINGTON, September 28.—The cement industry showed a slight decline in the number on the pay roll in August as compared with July, but an increase in the amount of the pay roll, according to figures of the Bureau of Labor Statistics of the Department of Labor.

The number employed on the weekly pay roll in August was 22,812 as compared with 23,992 in July or a decrease of 0.8 per cent. The figures apply to 72 establishments. The amount of the pay roll for one week in August was $671,916 as compared with $650,610 in one week in July, or an increase of 3.3 per cent.

The per capita earnings in the cement industry showed an increase of 4.1 per cent in August as compared with July.

Out of 62 reporting establishments furnishing data as to full and part time operation 97 per cent operated on full time in August and three per cent on part time.

Three establishments reported increases in pay ranging from five to ten per cent. The employees affected totaled 461.

Phoenix Plant Burns

Fire of unknown origin on September 14th destroyed the bag house, packing room, and three stock houses, as well as the finishing mill building and part of the contents of the finishing mill at the Nazareth, Pa., plant of the Phoenix Portland Cement Company. The loss, estimated by President Lindley C. Morton, to be approximately $350,000, is fully covered by insurance. The fire started in one of the stockhouses and, because of inadequate fire fighting facilities, made rapid headway.

Plans are already under way and contracts will be let within the next few days to rebuild everything destroyed with modern fire-proof construction. The rebuilding will require approximately five months and when completed, the entire plant will be fire-proof throughout. The rest of the mill was not damaged as it is of fire-proof construction and the kilns were started two days after the fire. Arrangements have been made to have clinker ground at neighboring plants. The company has made arrangements to procure sufficient cement to take care of all of its customers without interruption.

Prices Decline

WASHINGTON, September 28.—Wholesale prices of building materials were slightly less in August than in July, according to the monthly report of the Bureau of Labor Statistics of the Department of Labor. Prices declined two per cent from the July level. The index number of wholesale prices was 186 for building materials in August as against 190 in July and 172 in August, 1922. The index numbers are based on 100 for the year 1913.

The wholesale prices of most commodities are higher than a year ago, the general price level for commodities other than coal ranging from three per cent in the case of food to fifteen per cent in the case of metals and metal products above last year's level.

Cement ranks tenth among all manufacturing industries in power installed, according to the latest United States census figures. These census returns show that only two industries had more power installed per dollar's worth of products.

Construction Council Advises Caution

WASHINGTON, September 28.—Resolutions embodying a construction policy suitable for present conditions were adopted at a meeting of the American Construction Council held in New York last week. The meeting, which was attended by Brigadier-General R. C. Marshall, Jr., general manager of the Associated General Contractors of America, whose headquarters are in Washington, was the first held since the meeting of last spring when a curtailment in construction activity was recommended as a means of preventing undue inflation in prices of materials during the summer months.

The resolutions adopted at the recent meeting called attention to the suggestions of the spring meeting for a curtailment of construction and said that in consequence of these suggestions a considerable amount of construction work in contemplation was delayed. It was stated that although a large volume of work was done during the summer months prices of materials did not go to prohibitive heights which would have induced a buyers' strike. The construction industry accordingly is on a sound basis, the resolutions said.

Advice for the public contemplating construction work was given in the resolutions on three points, the first dealing with maintenance and repair work, the second with minor new construction, and the third with projects of large magnitude.

It was urged that maintenance and repair work should be done in the immediate future owing to the advantage of purchasing materials and securing delivery when construction work is ordinarily not at its peak.

It was urged also that minor new construction work which ordinarily can be completed in three or four months' time also should be commenced in the near future.

As to projects of larger magnitude the council expressed the opinion that caution should continue to be exercised in commencing them. It was stated that it is too early as yet to predict just what the situation will be next spring but that indications are that there will be a large volume of work and a demand for more labor and materials. A better estimate of the situation existing next spring, it is stated, can be made the latter part of December or the first of January.

The recommendations are intended to apply generally to districts throughout the United States though there are some sections, such as in the Northwest, where other conditions prevail.

General Marshall in discussing the Japanese reconstruction situation said that just now it does not look as though the American construction industry would be drawn on to any great extent. Whether the American construction industry will be called upon to assist in rebuilding the Japanese devastated sections he said would depend to a considerable extent on whether Japan adopts a different type of construction than in the past. He did not look for any immediate developments pending a careful survey of the situation by the Japanese government and the mapping out of a permanent building policy.

Urges Community Safety Drives

"The industrial accident problem in America, which is now causing approximately 20,000 deaths and 500,000 injuries annually, will never be fully controlled until the public accident problem is controlled," C. W. Price, Vice President of the Elliott Service Company, New York City, told the members of the American Society of Safety Engineers recently at a special meeting of that organization called in New York to consider the relation of public safety to industrial safety.

Some of the biggest industrial concerns in the country including the United States Steel Corporation, Mr. Price said, have already come to this conclusion and are now actually giving the workmen in their plants instruction in the prevention of accidents on the street, in the home, and in other public places. Industrial executives, he said, are beginning to realize that it is easier to get workmen seriously interested in accident prevention at home and on the streets than in the plant because in the former case the lives of their wives and children are concerned and the average workman even of the lowest type is usually more interested in the safety of his family than in his own life.

"In the city of St. Louis, for example," Mr. Price said, "110 industrial workmen were killed by accidents during 1917 and only 15 industrial fatalities ocurred there in 1922. How is this remarkable record to be accounted for? Arthur T. Morey, general manager of the Commonwealth Steel Company of that city and former president of the St. Louis Safety Council will tell you that this accomplishment was due in part to the intensive safety educational work done in the individual plants. But in a much larger part it was the direct result of the community wide public safety compaign which has been conducted in that city.

"It is only a matter of time—and a very short time at that—before industrial executives generally recognize what a few of the foremost industrial men now realize; that when workmen are reached outside of the plant with the safety idea, they come back to the plant not only more deeply interested in the prevention of accidents as employees, but convinced as fathers and citizens of the value of safety to them and their families."

"The question that we must consider, therefore, is whether safety can be organized in a community as it has successfully been organized in the great industries with a continuous campaign of education which will grip men, women, and children alike and cause them to stop being careless and cause them to be careful. Until very recently we could not truthfully say that such a thing was possible. My experiences during the last two years, however, in the public safety campaigns of New York City, Washington, Baltimore, Pittsburgh, and Louisville convince me that it is now possible for any community to organize the work of accident prevention on as scientific and as effective a basis as it is organized in the modern industrial plant, railroad, or public utility.

"In fact, it is now even possible for any city to secure the plans of the campaigns which were conducted in these five cities and the actual material with which to conduct a permanent safety campaign. The uniform success of the safety campaigns in spite of greatly divergent characteristics of these cities—New York the metropolis, Washington the residence city, Pittsburgh the industrial city, Louisville the typical Middle West city—is an almost certain guarantee that a similar campaign will bring about an appreciable reduction in accidents in any American city."

This photo shows the first reinforced concrete factory building in the west. It was finished in 1905 and successfully withstood an earthquake. It houses the power plant of the Paraffine Companies, Inc., at Emeryville, Calif.

Accurate data was kept on both conditions and performance. Left—Shows how temperature was measured. The thermometer was placed in mercury filled holes for one minute before readings were taken. Center—The road was blocked off in black lines and cracks were recorded on the chart as they appeared. Right—Measuring slab distortion after loads had traversed road.

Test Types of Concrete Roads at Pittsburg

Californians Find Thickened-at-Edge Slab Without Reinforcing Bars Best Able to Withstand Heavy Traffic Loads—Reinforced Slab Second Best

By C. W. Geiger

Realizing the need for more definite information concerning the construction of concrete roads, and desiring to arrive at a more or less accurate comparison between reinforced and plain slabs, as well as of the various outstanding designs of both kinds in use today, the Columbia Steel Company has completed a long series of experiments on a test road at Pittsburg, California. The project was carried on by the Columbia people in cooperation with the California Highway Commission, the United States Bureau of Public Roads, Lloyd Aldrich, highway engineer, and John B. Leonard, structural engineer.

All things taken into consideration Section J, six inches thick, nine inches at the edges, and containing no reinforcement, was the best, and Section I, five inches thick, with two seven inch inverted curbs, containing reinforcing bars, was second best. In Section J the total broken area in square feet per square yard pavement was 0.07. That of Section I was 0.36. The total lineal feet of cracks per yard of pavement in Section J was 1.44 and in Section I was 2.01. The theoretical maintenance cost per mile of Section J was $885 and of Section I was $4,205. The computed original cost per mile of pavement only for Section J was $31,439 and for Section I was $33,271. The percentage of failure of Section J was 2.8 and of Section I, 12.6.

In planning the tests, the engineers set out with the purpose of finding, if possible, the most desirable type of pavement. The intention was to secure information on the relative merits of enough different types, including those embodying the ideas of the Columbia Steel Company, to enable engineers to design highways with greater certainty of results. To insure construction methods that would parallel those used on actual highways, only those already found practicable in the field were adopted. One objective was that this test should represent to the fullest extent the ideas of engineers and officials actually engaged in highway construction.

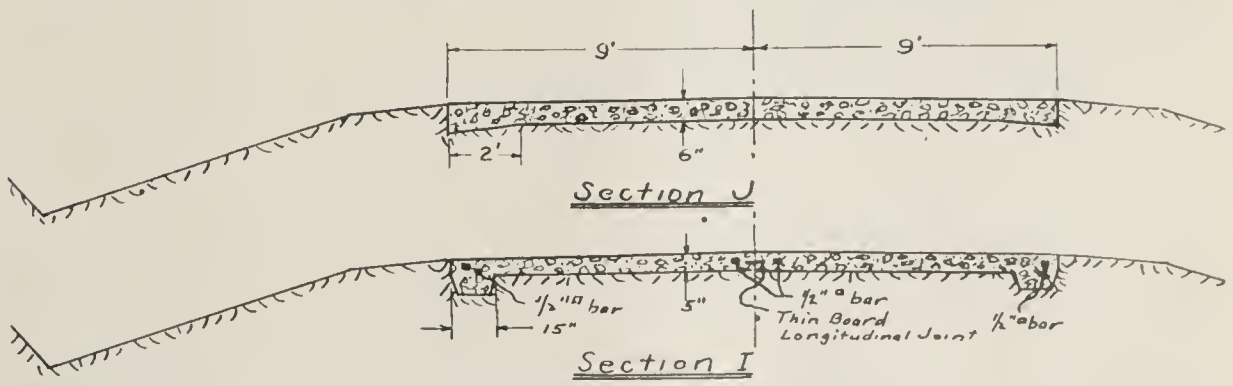
The selection of designs to be used became an important question. It was considered vital that the designs should represent the ideas, as far as possible, of the engineers engaged in highway construction. Accordingly a questionnaire was sent to all California engineers who were understood to be interested in this class of work. Many designs were received, frequently with supporting arguments more complete than could be conveyed by merely answering the questions. The sentiment was unanimous that the test should be conducted on adobe soil, which has the property of expanding to a very great degree. A sample of the adobe taken from the Pittsburg test highway expanded forty-two per cent when wet. When adobe dries out it leaves wide cracks. It has a vertical as well as horizontal expansion. This type of soil is very common in the valleys of California.

The plan was for a track of two tangents, joined with semicircles and wide enough to permit two lines of travel. The foundation for the pavement was on adobe fill, since such soil, which is found in certain locations in the western and southern states, presents, particularly under fill conditions, one of the most difficult construction problems. The complex action of adobe, particularly under variable moisture conditions, is a source of trouble and failure. It was intended to investigate the efficiency of both plain and reinforced concrete pavement of variable thickness and design on such subgrade. The effect of the expansion and shrinkage actions of adobe subgrades due to variable moisture content, on pavement was to be given special attention.

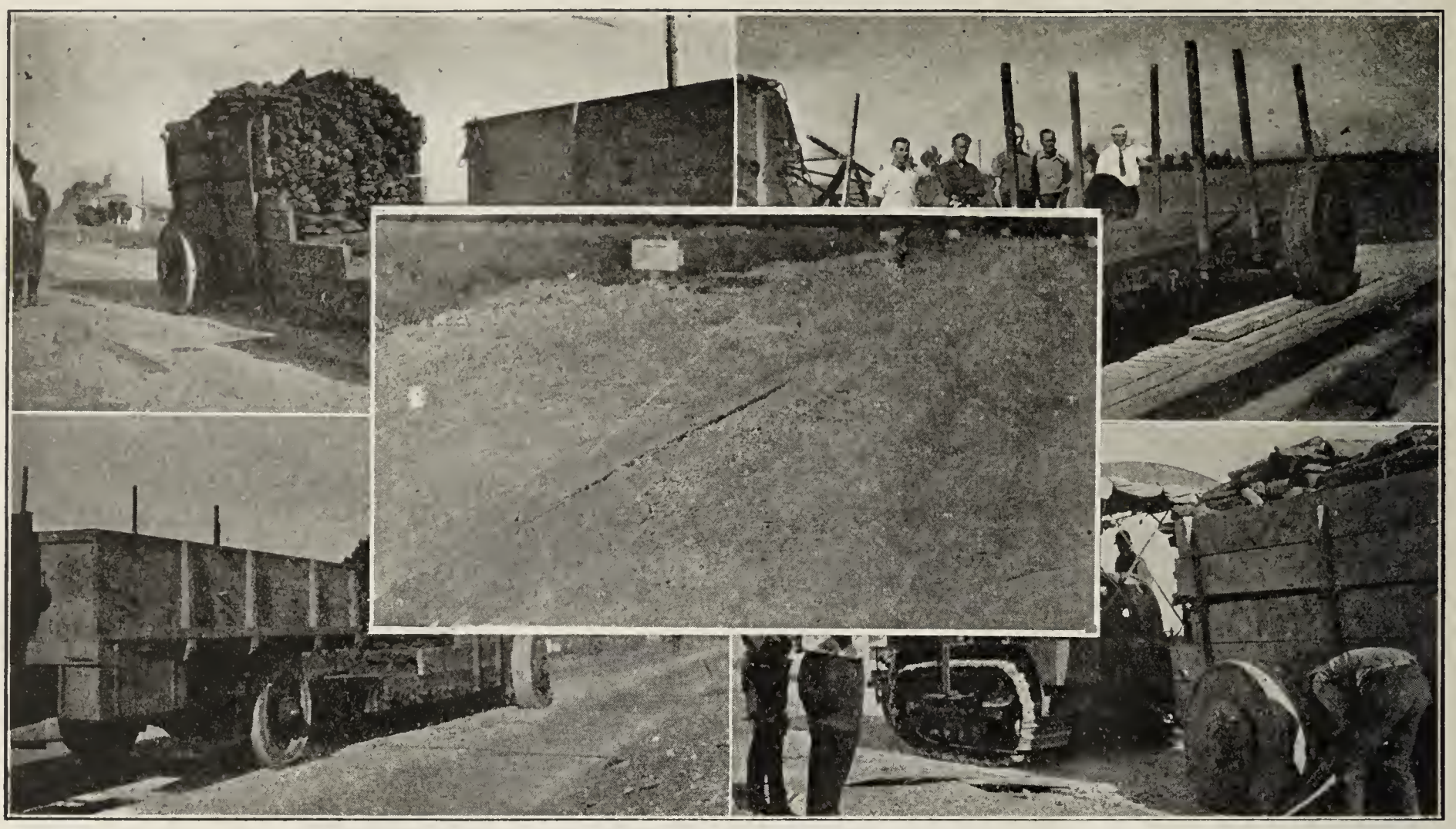
As a result of the advice of State and Federal highway men, thirteen types of road, including practically all designs suggested, were agreed upon for the test road. These sections included both plain and reinforced concrete with thicknesses of from five to eight inches. The width of the entire road was eighteen feet. Three sections, C, D, and L, described later, were designed by the Columbia Steel Company.

For the construction of Section A, a loose rock fill was made on the subgrade. After the grade was properly prepared by scarifying, sprinkling, and rolling, and before the header boards were placed in position, the middle portion was excavated between the limits of two feet outside of the lines for the header boards, or eleven feet either side of the center line. This excavation was run from a depth of six inches at the edges, to twelve inches in the center below the under side of the proposed pavement. When this was accomplished, the excavated section was filled with loose rock ranging in size from four inches on the bottom to one inch on the top. Care was taken to have the larger rock, containing many voids, on the bottom, to insure ample drainage. At various points trenches were dug to connect with the gutters, and these trenches were filled with rock in the same manner.

When the rock fill was made the surface was rolled by a three wheeled road roller weighing ten tons. Additional small rock was added, as required, to bring the surface to a height of the proposed pavement. Then loose dirt was spread over the rolled rock, for a width of nine feet on either side of the center line, and rolled. Sufficient dirt was



Section J, above, containing no reinforcing, proved the best. Section I, below, reinforced, was the next best.



Views showing interesting phases of the tests. Upper left—Trailer carrying fifty ton load. Its ten inch steel tires may be seen cutting through the five inch concrete. Upper right—The five ton trailer ready to be loaded. Lower left—Section of the road which withstood the test. Lower right—Getting trailer out of hole by means of tractor pulling from rear. Center—Furrows cut in one section by trailer and its load.

added so that it would be a little higher, when rolled, than theoretical subgrade elevation.

Details of Sections

Section A was 150 feet in length. The concrete slab was five inches thick reinforced with ⅜ inch structural grade steel bars, placed in center of the slab eighteen inches on centers.

Section B was 5 inches thick, 150 feet long, reinforced with ⅜ in. structural grade steel bars, placed in center of slab, eighteen inches on centers.

Section C was six inches thick, 45 feet long, reinforced with ¾ in. special grade steel bars, placed on top and bottom of slab diagonally, nine inches on centers.

Section D was six inches thick, 105 feet long, reinforced with ⅜ inch special grade steel bars of about 70,000 lbs. tensile strength, placed in top and bottom of slab diagonally, nine inches on centers.

Section E was eight inches thick, 118 feet long, no reinforcement, cold joint longitudinally middle, four inverted curbs eight inches deep.

Section F was eight inches thick, 118 feet long, no reinforcement, two inverted curbs 12 inches deep.

Section G was six inches thick, 150 feet long, reinforced with ⅜ inch special grade bars, placed in top and bottom, 7½ inches on centers.

Section H was five inches thick, sixty feet long, reinforced with ⅜ inch structural grade steel bars, placed in center of slab, eighteen inches on centers. Cold joint longitudinally in middle.

Section I was five inches thick, ninety feet long. Reinforced with ⅝ inch structural grade steel bars, placed in center of slab, eighteen inches on center, cold joint longitudinally in middle. Two inverted curbs seven inches deep.

Section J was six inches thick, nine inches thick at edges, 118 feet long, with no reinforcement.

Section K was five inches thick, 75 feet long. Reinforced with ⅜ inch special grade bars placed in top and bottom of slab diagonally, nine inches on centers.

Section L was five inches thick, 75 feet long, reinforced with ⅜ inch special grade steel bars, placed in top and bottom of slab, diagonally, nine inch on centers.

Section M was seven inches thick, 118 feet long, no reinforcement, with corrugated iron joint longitudinally in the middle, and with four inverted curbs eight inches deep.

The Subgrade

The site of the test highway was a field in which the soil was a very obstinate black adobe. The ground sloped gently from the south to the north. To avoid variations of subgrade condition the entire subgrade was on fill. On the south side excavation was carried to three feet in side borrow pits and the material placed loosely outside. The fill for the entire track was then started approximately three feet below finished subgrade elevation. The bottom soil was first plowed about eight inches to produce a bond, and layers of earth approximately nine inches in thickness, loose, were successively placed from the borrow across the entire width of roadway, and each layer was pulverized by using a disk harrow followed by a straight tooth harrow and a Johnson scarifier. After pulverization was complete, a light spray of water was applied over each entire layer sufficient to moisten but not excessively wet the soil, and to aid in compacting it into a dense homogenous mass. A twelve-ton three-wheel road roller rolled each layer. Weak spots in the subgrade layers that developed were excavated and refilled, and rolling continued. The compacted layers were approximately six inches thick and each was scarified with a Johnson scarifier for two inches to furnish a complete bond with the succeeding layer.

On this approximately completed subgrade, header boards were set true to line and grade and extending slightly below the surface. Then the material between was scarified to a depth of six inches by a Johnson scarifier. The surface was then graded with a Carr subgrade machine to an elevation approximately 1½ inches above subgrade. The surplus earth was temporarily placed on the shoulders. Then the subgrade was scarified to a four-inch depth and water applied with a very light spray. Immediately the subgrade was rolled from the edges inward. While still moist it was again cut with the subgrade machine to the correct elevation. Up to the time of laying concrete the subgrade was given a light sprinkling daily to prevent cracks forming. Where inverted curbs were involved in the design, excavations were made with pick and shovel.

Concrete Mix Used

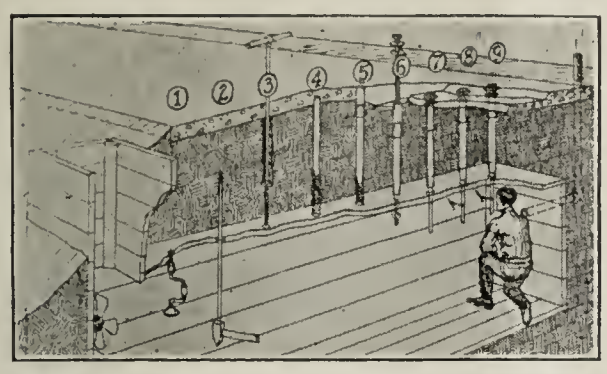
Coarse aggregate for Section M was crushed rock, ranging in size from one-quarter to 1½ inches. The mix was 1:2¾:4 by volume, with an excess of fines in the coarse aggregate. In all other sections the coarse aggregate was river gravel ranging in size from one-quarter to 1½ inches, and the concrete mix was 1:2:4. Old Mission Portland cement was used and water from the Pittsburg city wells in all the concrete.

Operations During Construction

A Multi-Foote four sack batch mixer with boom and bucket discharge was used in mixing all the concrete. The mixer was also equipped with a boom near the skip, which picked each batch

box off the car, then swung it around and dumped it directly into the skip of the mixer, thereby eliminating the placing of any material on the subgrade. The concrete was a dry mix, just enough matter being used to obtain a plastic mix that could be worked well, but great care was exercised in preventing it from being too wet.

For placing steel in the reinforced sections a cradle was designed and built



Drawing of the pit, from which readings were taken under the road.

by the Columbia Steel Company and attached to the mixer. With this device either a single or double layer of reinforcing bars can be accurately placed within the pavement. A Lakewood tamping machine was used for tamping all sections with the exception of one or two placed on the curved ends of the track.

In most places a longitudinal wooden float eighteen feet long was used for a final finish for the concrete surface, but there were times when progress was slow and this float could not be used to advantage. Then the usual small wooden float was substituted. Immediately after finishing, strips of burlap were placed on the wet concrete and lightly sprinkled. After initial set these strips

Showing the interior of the underground pit.

were moved ahead to green concrete, and the surface uncovered sprinkled with water, and in turn, as soon as possible, covered with one-half inch of loose dirt, sprinkled as applied. This earth cover was kept wet. The following morning dikes were built on the surface and the ponds were filled with water so that there was for fourteen days a minimum of two inches of water at the crown of the pavement. The concrete was not, however, opened to travel until three months after pouring.

During the pouring, test cylinders were cast beside each section for the material used for the corresponding section. These cylinders were cured in the same manner as the pavement, and were 6x12 inches. Results of the compressive tests of these cylinders were such as to command little, if any, confidence.

Use Observation Tunnels

An important feature of the test was to be a study of the stresses to which concrete pavements are subject, especially stresses of flexure. Since the usual strain gauge procedure for measuring stresses on the surface of concrete is largely for static load conditions, which are not completely representative of the action of the highway, it was desirable to supplement this method to include the action under moving and impact loads.

Direct observations of the normal action of pavement under moving loads could only be obtained from the under side of the pavement. Tunnels were accordingly built under Sections B, D, G, and I, at such depth that there was sufficient earth between the roofs and the bottom of the pavements to insure normal action. Three feet four inches of earth were placed between the bottom of the concrete slab and the top of the observation tunnels. This depth was determined by scientific investigation of the distribution of pressures through soils, it being found that there was very small load pressure at a depth of three feet and four inches.

The tunnels were as narrow as permissible to permit observations and extended across the entire section of the pavement. Rods spaced about two feet apart extended down from the pavement into the tunnels with the upper ends cast into the concrete. By means of delicate instruments the slightest movements of the rods could be observed and recorded under any loading. Another similar set of rods was installed for studying the action of the subgrade. The upper ends of these rods were fastened to flat plates resting on the subgrade directly under the pavement. The lower ends projected into the tunnel for corresponding observation.

Level observations begun September 28, 1921, were expected to yield information regarding the action of the adobe under variable moisture conditions. A few days showed movements of the pavements that could hardly be accounted for by any reasonable action of the subgrade. It was apparent that a more accurate and intensive study of these motions was essential. Movements of the pavements due to changing temperature were originally expected to be horizontal so an extensometer with a ratio of about 60,000 to 1 was provided for their measurements. Careful observation soon clearly indicated vertical pavement movements that were continuous and probably the result of variable temperatures. Correlation of the rate of change of temperature of the concrete in the pavement throughout its thickness, with closer observations of the vertical movements, showed that these movements were caused by variations of temperature.

The visible effects of traffic on the pavements were noted by crack records, which required the daily plotting of all cracks as they appeared and also of disintegrated areas, on specially prepared drawings to scale. For this purpose the entire track was painted into six foot coordinate squares, so that the location of each crack could be readily plotted. The crack record also shows the dates on which cracks occurred and their extent and so shows very accurately the history of the behavior of these pavements.

Consider Moisture

Ditches built on each side of the road could be filled with water from an elevation below the base of the new fill to the elevation of the bottom of the pavement. Thus moisture conditions could be made to correspond to a rainy season or to a condition that too frequently occurs where irrigation exists. Equalizer pipes built in the grade insured the same water elevation on each side of the road. As it was expected that the investigation would be completed before the California rainy season, water was piped to the test.

On December 21, 1921, the ditches were filled with water to the elevation of the bottom of the pavements. This water level was maintained in the ditches until the traffic was discontinued January 30, 1922. However, the water was not drained away until the middle of March, 1922. It was anticipated that with the ditches full of water the grade would soon become saturated and the destruction of the pavement accelerated. The rains were also expected to contribute very materially to this result. This opinion seemed to be shared by visiting engineers who had experience with adobe

The load was allowed to drop off a triangular shaped board to test slab for impact performance.

under such conditions. The result did not meet the expectations. Only a very small amount of additional moisture was taken up by the grade. The moisture determination of the borings indicated that beyond a lateral distance of two feet from the water, absorption was very small. This resistance of the grade to moisture penetration can be attributed to the manner in which it was built.

The first study in the tunnels was of the action of the pavements under truck loadings. A truck equipped with solid rubber tires, loaded with pig iron till the gross weight was seven and a quarter tons, was used throughout the investigation.

Static and Moving Tests

Observations were made for static, moving and impact conditions of this

The apparatus constructed by Columbia Steel Company for laying reinforcing bars.

truck before regular travel was started, and also one day each week during the entire traffic period. The deflections of the pavements under the entire static conditions were determined for three selected positions along the line of travel; one at each side of the track and one on the center. In a few cases two

trucks, both loaded as was the test truck, were used.

The moving truck tests required the truck to travel twelve miles an hour over the positions of the static tests. It was found that the deflections for this condition were less than those for static loading.

The impact tests were made by passing the truck over a triangular strip of board, causing a vertical drop to the pavement directly over the pavement rods. The speed of the truck in this test was always twelve miles per hour. The position of the impact board was determined by trial so that the point of the initial blow from the rear wheels would be on the line of the tunnel pavement rods. The positions of the impact tests were the same as those for the moving and static observations.

So far as could be determined there were no cracks in the pavements over the tunnels caused immediately by 236 impacts of the truck in these special impact tests.

Traffic was started November 9, 1921, in two lines moving in opposite directions. These two lines were continued until December 24, 1921, when due to broken conditions of some portions of the track only a single line was used. This single line was continued until Janary 29, 1922, when traffic was suspended until June 1st. When the second period of traffic was begun on June 1, 1922, the pavements had been thoroughly repaired and travel was again in two lines, and so maintained for the balance of the test. Traffic was finally discontinued on July 27, 1922, with an intermission between July 1st and 24th. For a short time during this second period traffic was also started between four and five o'clock in the morning, when the edges of the pavement were "curled up." Gross loads were also increased during the test from a uniform load of 7¼ tons to loads in some instances as great as 13½ tons.

The U. S. Bureau of Public Roads and the California Highway Commission each supplied twenty trucks, and the California Highway Commission furnished all of the drivers. The daily average of trucks on the track was about 32 as long as the double lines of travel could be maintained. This number of trucks was determined to be the best for passing the largest tonnage over the track each day, as more trucks tended to retard the speed of all, thereby reducing the tonnage. When it was found necessary to reduce the travel to a single line, the average was about nineteen trucks. A speed of twelve miles an hour was maintained throughout the test. It was soon found necessary to give the drivers a fifteen minute rest in the middle of the forenoon and afternoon as four hours of continuous driving of this character was more than could be safely driven. There were thus seven and a half hours of travel each day and this schedule was maintained six days of the week. The day that travel was suspended was utilized for making tunnel tests.

At the conclusion of the truck travel tests on July 27th, the concrete pavement had not failed sufficiently and it was desired to make a further test to determine the tonnage required to cause complete failure of different sections. Accordingly super tests were carried on for seven days.

Super-Tests Employed

In these tests a two-wheel trailer equipped with dual five-inch steel tires carrying a load of about sixteen tons made 105 circuits and a few places were shattered on the five-inch concrete base. The trailer was then loaded to about 30½ tons and the weaker five inch sections showed failure under the rear wheels in several places except that one five-inch section that was reinforced top and bottom was not seriously affected. The trailer was then loaded to fifty tons and cut entirely through a five inch section and stock. This was unloaded to thirty-five tons and made three circuits which increased the broken areas in the weaker five-inch sections but the other sections were not appreciably affected.

The trailer was then loaded again to fifty tons and three circuits made, the rear wheels cutting two furrows in the concrete in the weaker portions of the five-inch sections.

Two sections six inches thick and reinforced top and bottom shattered very little. A six-inch section with thickened edges but not reinforced was almost unaffected. Except one five inch section all sections that carried inverted curbs and no reinforcement were practically unaffected. The trailer carrying the fifty tons was equipped with dual five inch steel tires and on all of the slabs slight abrasion of the surface was noted.

The methods and results at the Pittsburg Test Highway have recently been published in an extensive report for the benefit of those who are interested in the construction of public highways. The great mass of observations have been condensed in the form of graphs in nearly all cases so as to convey a clear understanding of the investigations. It is believed that the information secured in this investigation will be of material aid in the future design and construction of highways and will also be of valuable assistance in any further research of this character.

Conclusions Reached

The results of these investigations warrant the following conclusions:

First—The method of constructing the subgrade on adobe soil, so reduced the objectionable features of this material that a reliable foundation for the pavements resulted.

Second—This subgrade was not injured by the water which filled the side ditches for three months.

Third—The unsurfaced concrete completely resisted all surface wear due to solid rubber-tired traffic. The limited metal-tired travel indicated that it would cause, with sufficiently heavy loads, an early failure of surface.

Fourth—Early morning travel was potentially more injurious to the pavement than the day traffic.

Fifth—The observed deflections of the pavement are very nearly directly proportional to the loads.

Sixth—Those sections that had steel placed in such positions that enabled it to resist the tension flexural stresses were more durable than those sections of the same dimensions that did not contain steel so placed.

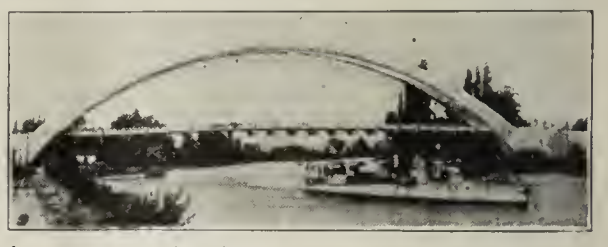
Concrete Roads Lead

WASHINGTON, September 28.—Figures which have been compiled for the annual report of the Secretary of Agriculture show that during the fiscal year ending June 30, 1923, 1,440 miles of concrete federal aid roads were completed. The total mileage completed of all kinds of roads was 8,820. The concrete roads formed the largest group of paved highways. Brick federal aid roads completed during the year totaled only seventy-nine miles while bituminous concrete roads amounted to seventy-seven.

Gravel and graded earth roads were completed in larger mileages than concrete. The gravel roads completed totaled 3,815 miles while the graded earth roads totaled 1,860 miles.

At the close of the fiscal year there were 14,772 miles of federal aid roads under construction. Of this mileage 2,525 miles were concrete.

A tabulation of average accepted bid prices in July on federal aid road projects shows that the average price for 43,151 cubic yards of Class A concrete was $19.80. Accepted bids on concrete averaged from $10.20 to $35.00 per cubic yard.



An unusual sight on the Seine, Destroyer No. 115 of the French Navy passing under the arch-suspension bridge at Saint Pierre du Vauvray, near Paris. The bridge is said to be the largest made of cement in the world. It is 160 yards long. Note the odd way in which the causeway is suspended from the two concrete spans.

Study Oil Effect

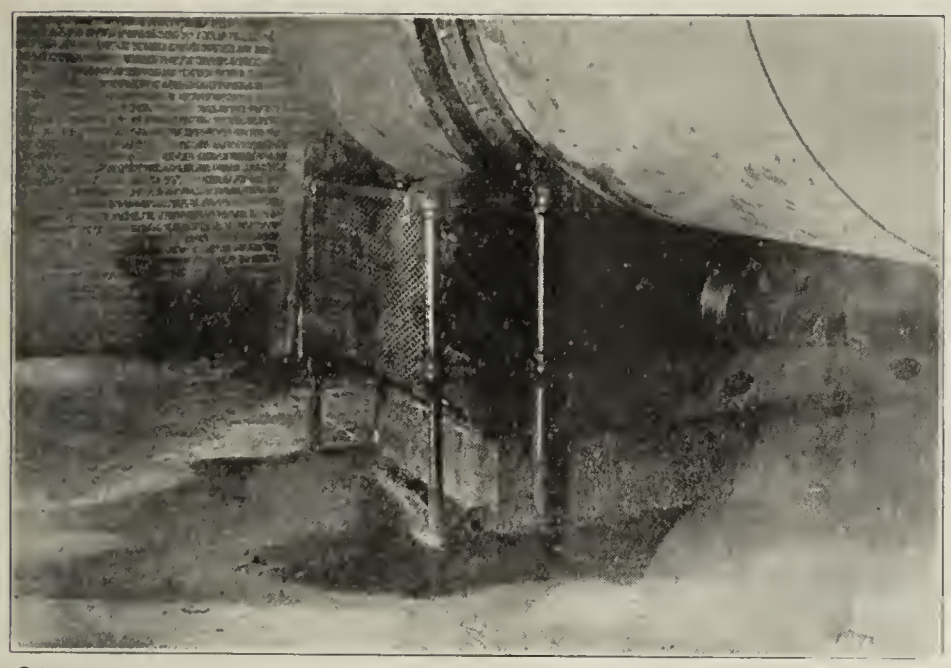
WASHINGTON, September 28.—The Bureau of Mines is making a study of the effect of various oil-well waters on the setting of cement at its Petroleum Experiment Station at Bartlesville, Oklahoma. The bureau has issued the following statement on the subject:

"Petroleum engineers of the Bureau of Mines in the course of their investigations are frequently told by operators that the chemical characteristics of waters in their wells are such as to prevent cement from setting. Where surface tests have been made at these wells, it has invariably been found that a good grade of cement, properly mixed, will set in water from the well. This indicates that conditions in the well such as movements of fluid, agitation by gas, or improper preparation of the hole for cementing are among the causes for the failure of cement to set. The bureau's engineers are, however, not convinced that cement will set in all oil field waters and therefore are striving to obtain samples of oil field waters where difficulty has been experienced in securing a proper set. By collecting numerous samples of waters from various fields in the United States and making tests with cement it is hoped that useful information may be obtained regarding cement failures in wells.

"The bureau is therefore requesting oil operators to furnish samples of waters from wells where difficulty has been experienced in securing a proper set. Water samples should be sent to the Petroleum Experiment Station, Bureau of Mines, Bartlesville, Oklahoma, accompanied by a data sheet giving owner and well number, location and depth of well, and information regarding the method of obtaining the sample."

Why Oil Expense Increases

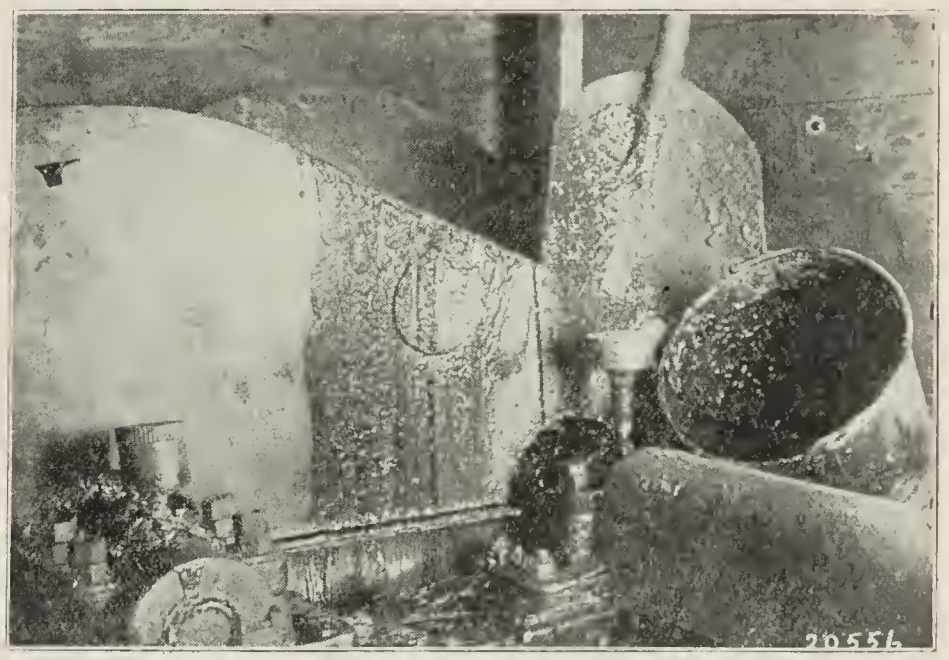
The following photographs, as well as last month's article, "Do Your Profits From Cement Drip Away?" were furnished by the courtesy of the Technical Department of the Vacuum Oil Company.



Oil wastage due to incorrect application and the use of an unsuitable oil. An outstanding case found on a dryer, on which a considerable amount of money is wasted annually

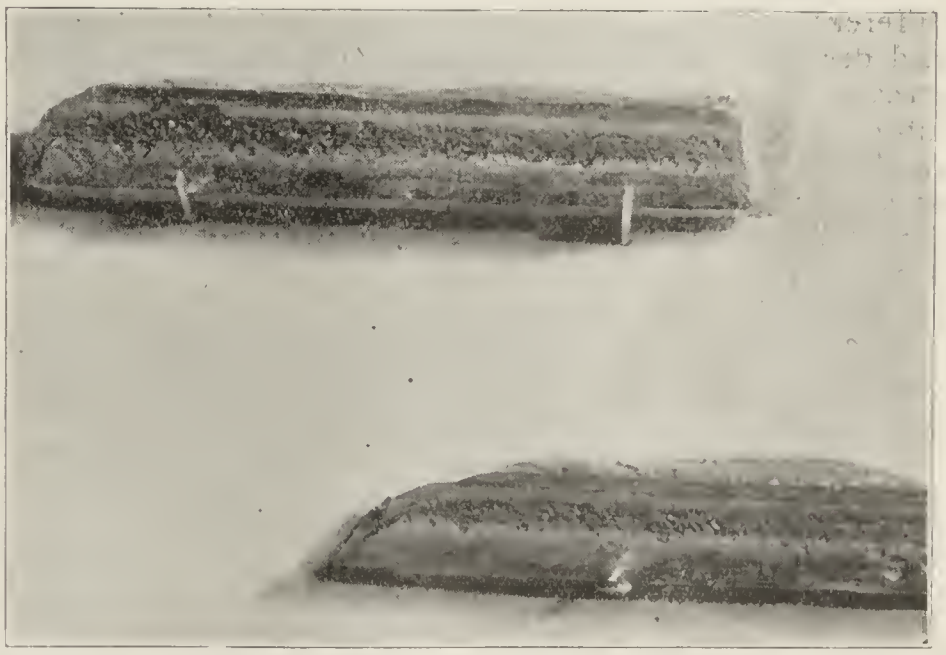
Collection of oil on the floor due to overapplication of oil to bearings above. There is not only waste but also danger due to fire and personal injury.

Incorrect handling of oils and greases throughout plant. Material contained in cans was filled with abrasive dust, which has very destructive effect on bearings.



Bearings on gear set lubricated with grease inefficiently applied, resulting in extreme wastage and high lubricating cost.

Main bearing of a mill. The bearing has completely worn through cast iron housing, thus demonstrating that the human element is an important factor in lubrication. Carelessness was the cause of this failure.



Two pieces of teeth taken from reduction gear set which was lubricated in a bath of oil. These pieces were examined after breaking off and were found to be pitted due to oil-acidity. Result of use of incorrect oil.

CEMENT and ENGINEERING NEWS

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Concrete for Permanence

American steel concrete buildings in Tokyo and Yokohama withstood the recent earthquake and are still in good condition, according to a cable from Assistant Trade Commissioner G. C. Howard, stationed at Kobe. These structures, put up by American engineers applying advanced scientific principles, are known as earthquake proof factories and office buildings. They have all been put up within the past three years and stand today in defiance of Japanese building ideals.

The people of the Orient, knowing that they are frequently visited by such earthly disturbances, have persisted in using buildings of extremely light construction, buildings whose chief constituents were bamboo, matting, and even paper. Some of the better structures have made use of thin sheets of American lumber. The theory of the designers has always been that, although their structures will not withstand quakes, the loss will not be as great as it would have been had more elaborate homes, offices, or factories been built.

Americans, however, attacked the problem from a different angle. They viewed the situation thoroughly and decided to erect buildings which could not be destroyed by an ordinary disturbance. They chose reinforced concrete for their material, and designed reinforcing which would yield a building which would be almost solid in every way. It has indeed been said that those structures could be pushed over without injury. That is probably merely a forcible way of saying that they are quake proof.

Perhaps the Japanese will learn a lesson from their American friends. Perhaps when they rebuild they will choose concrete structures instead of using material of which fire makes tinder and which nature considers as eggshell. Perhaps the king of modern building materials, Reinforced Concrete, will be adopted.

Work All Year

Elsewhere in this issue we have reprinted an article dealing with the advisability of winter construction in stabilizing industry. The argument seemed so logical that we thought it highly important that our readers should be allowed to see it.

The old idea that construction industries should operate only during warm weather seems, under modern methods, to be a thing which should be relegated to the past. Overhead continues during the period of inactivity, but revenue stops. Construction could well be made an all-year-round industry.

Concrete Roads

According to statistics issued by the Bureau of Public Roads, over thirty-eight percent of the money spent in the United States since 1913 for roads has been expended for concrete, constituting now eighteen percent of the total mileage. Of the total expenditure of over seven hundred and thirty millions, two hundred and eighty-three millions were put into concrete. Gravel was second in the matter of cost, claiming for its figure over one hundred and sixty millions of dollars. Other materials came in for their shares in a rapidly descending scale.

The figures are decidedly in favor of "Roads for Permanence." We must remember that, although concrete roads have been used to a slight extent in the past, it is only within the past few years that they have been built in any great numbers. Tests like the Bates Road Test and the Pittsburg Test will soon convince the public that cement is the best road building material if the road is to last and to give superior service. Those tests also give the engineer information from which he can get more detailed and accurate information as to the design of superior pavement. Concrete today is well received, but its complete domination awaits the results of tests recently completed and now being carried on to determine a most suitable design. Concrete has certain peculiar properties, especially noticeable in road slabs, but they are now being studied and remedies are fast being provided.

Make More Money

In spite of any idealistic assertions to the contrary, we all like to make money, we all like to make lots of it, and we would all like to make just a little more. Some men keep their eyes open to opportunities and amass fortunes. Others let the world go by unnoticed and die in the poorhouse or in anxiety as to the source of the next meal.

There are opportunities before us always. Take for instance the possibility of installing a line of concrete burial vaults as a side line in a regular concrete products enterprise or as a business in itself. Others seem to have made quite a little money out of such undertakings, and the field seems to be open for still more people who are willing to invest a pittance and a little hard work.

Queer as it may at first seem, the concrete burial vault business has one thing decidedly in its favor in that the demand never slacks. People always die, and the survivors consider nothing too good in showing their regard for the deceased. Whether business in general is flourishing or not, they demand decent burials and good burial vaults. Here this particular concrete product has its inning.

A great deal of untrammeled territory is yet open. The man who is now manufacturing building blocks, tile, vases, or anything else made of concrete, might gain a great deal by thoroughly investiating the burial vault possibilities. The man who is contemplating entering the field can lose nothing but postage by an inquiry.

CASE LIBRARY

Shall the State Operate Cement Plants?
VI

There is nothing that is unusual in the growing tendency among the various states of the Union to threaten to take a hand in the conduct of private industries. The minds of most of us run in similar channels and when the style calls for short skirts or peg-top trousers we wear short skirts or peg-tops, and when they are banished by the decree of fashion, we wear them not. That the political minds run in one unvarying channel is, if anything, more true.

Now the state governments of these United States have had an example set them by the federal government—an example extending over a period of years, and still extending. That example has to do with a proposed cure of the ills, imaginary or real, that from time to time attack our private industries; and the proposed cure, offered by the solons at Washington, is government operation or control. The fact that as economic doctors the Washington or state capital politican is about as well equipped as was the old-fashioned caravan doctor with his cure for snake bite complicates matters, but does not change them.

In previous articles we have outlined past experience of our federal government with railroads and coal, and now let us turn to cases of state interference in private business, which point out in what direction the political minds in every political cirle are running. Things have gotten to such a pass that it is worth stopping on the way to remind us that political "blocs" are springing up to represent different groups of industries, although the outline of our plan of government purposes that the public as a whole is to be represented by each man in government.

Not so very long ago one of the western states decided that the price of gasoline was too high. It proposed to buy gasoline and to sell it at cost to consumers —it proposed to teach tyrannical private industry that it will have state competition if it does not keep prices at the level which the politicians, with no knowledge of costs or conditions and no money invested, think they ought to be. True, as a result prices on gasoline fell sharply, and probably some of you reading this article feel that this state's governor did a world of good for humanity.

Let us pause again to point out, before attempting to analyze the fallacy in the governor's position, that during the past few years few commodities have increased in price more than has the commodity called "government." Gasoline is not for most of us an unescapable essential; government we are forced to buy and pay for, whether the bill be high or low. The causes of the increase in the cost of government are many, but among them the expense of governmental interference in private business is not the least. When government takes a hand in oil, then we all contribute to the purchase price of oil whether we use it or not, since the bureau needed to handle the oil business is remunerated from the tax box.

Another state is even now going through a tempest in a tea pot about the cement industry and threatening to build a cement plant, or plants, of its own, not only to supply cement for state highways but also to be sold to private contractors as well. An investigation of conditions in the cement industry is being made with a judge acting as a one-man jury, and from the press one gathers that, although cement has an outward appearance of being white, its heart is black.

The main point of attack is the fact that prices are practically uniform, no matter from what concern a contractor buys or with whom the state attempts to contract. Isn't that a terrible state of affairs? It is intolerable! The same commodity costing the same price in the plants of different manufacturers!!

Step into a bakery and ask for a loaf of bread, and then into another bakery and make the same request. Call on a dozen or fifteen, and the price of bread will be found to be the same. It is true of milk, true of packaged goods, true of practically every commodity we buy. This is due, not to monopolistic control, but to the glorious fact that the infusion of the American standard of living into the hearts of the men who live in this nation; it is due to the fact that with costs of production being practically identical, with standards of living being on a high plane, prices must inevitably be in accord.

Does this state propose eventually to operate the grocery, the milk stand, the restaurant, and other industries because prices for equal goods are equal? Why not take over the railroads of the state because fares between two points are identical on two railroads? Or run the newspapers, because their selling price is the same?

Where can the state stop if it embarks on such an undertaking based upon the uniformity of price?

In recognition of the advantages to the public which accrue to the public through stability of price, many states have created public utility commissions which work entirely contrary to the criticism made by this state of the cement industry. In the case of street transportation, gas and electricity, as well as telephone, they in effect endorse and compel monopoly, and standardize commodity prices beyond the possibility of competitive attack. Where is the consistency of the two positions?

We do not have to go far to find that consistency—it is political, lock, stock and barrel. The politican knows that issues are the foods his welfare feeds on, and an issue is not particular of what it is made. Attack cement, talk the necessity of downing the octopus "trust," suggest the advisability of state owned plants, and lo! you become a prophet in the wilderness, leading "the people" from tyranny to light. The people forget so readily that the last time you led them into a sinking quicksand, and will follow you blindly if you call loud enough.

Yet thinking men must consider what state owned cement plants would mean in this age of cement, with ribbons of transportation being wrapped in every direction around our commonwealth. State cement plants would mean power for the state, more millions to handle, more bureaus and commissions to do the handling, more taxation, less private industry to tax. They would mean, as other such experiments have meant, a deadening of individual initiative, an increase in inefficiency, a premium on vote-getting importance rather than upon business ability.

The railroads did not halt the attack of government upon them; the coal industry took its medicine without an effective protest—it rests with the cement industry to rise up and say to the state: "You shall not pass." Otherwise this gluttony of government for the management of industries it does not know will become chronic, and the well-being of the nation will be destroyed.

Japanese Will Probably Not Need U. S. Cement

Local Mills Can Divert Exports to Home Use and Supply Unusual Demand Caused by Reconstruction of Devastated Tokyo and Yokohama

WASHINGTON, September 28.—Officials of the Department of Commerce are doubtful if the American cement producing industry will be affected in any marked degree during the reconstruction of the Japanese areas devastated by the recent earthquakes. Definite information is available that Japan will require large quantities of American lumber and presumably other supplies of various kinds. The situation in cement, however, is such as to lead officials of the Far Eastern division of the Bureau of Foreign and Domestic Commerce of the Department of Commerce to suppose that Japan quite likely will continue to obtain such cement as may be needed from its own factories. These officials have first hand knowledge of conditions in Japan from comparatively recent tours of observation in the Orient but they have received but little information in cable dispatches since the earthquake applying directly to the cement situation.

The outstanding facts relative to the cement situation in Japan are that this nation has heretofore produced not only sufficient for its own requirements but has exported considerable quantities to China, the Philippines, the Dutch East Indies, and other parts of the Orient and that there is comparatively little concrete construction in Japan. If Japan has imported any American cement in the past the amounts have been so small as not to appear either in the records of the Department of Commerce or in the official Japanese statistics. Presumably there will be a greater demand for concrete construction in Japan in the future but that there has been little of it in the past may be recognized by the fact that here are only nine modern steel concrete buildings in Japan and by the fact that dwelling houses have been made of paper, straw, matting and wood and usually without foundations.

Gratification is expressed by Department of Commerce officials that the nine modern steel concrete buildings withstood the earthquake shocks. Seven of these are located in Tokyo and two in Kawasaki. These are factories and office buildings. The manner in which these buildings survived the disaster undoubtedly will give an impetus to a wider use of this form of construction in the future. Also there will be occasion for the use of cement in the rebuilding of bridges, docks, and other improvements of that nature. It is considered doubtful if there will be much demand for cement in connection with the building of private houses.

Even if there is a more widespread use of concrete construction in the future this demand is not likely to develop immediately owing to the fact that the Japanese government has placed a ban upon the construction of anything but temporary buildings. This policy has been establshed pending the formulation of a permanent building program involving the widening and straightening of the narrow and crooked streets of Tokyo, the laying out of public parks, and the development of other plans of this character. It is expected that after a permanent building program is outlined some of the larger and richer industrial concerns will construct concrete buildings. The immediate demand, however, will naturally be for lumber for temporary buildings.

Local Mill Will Supply Demand

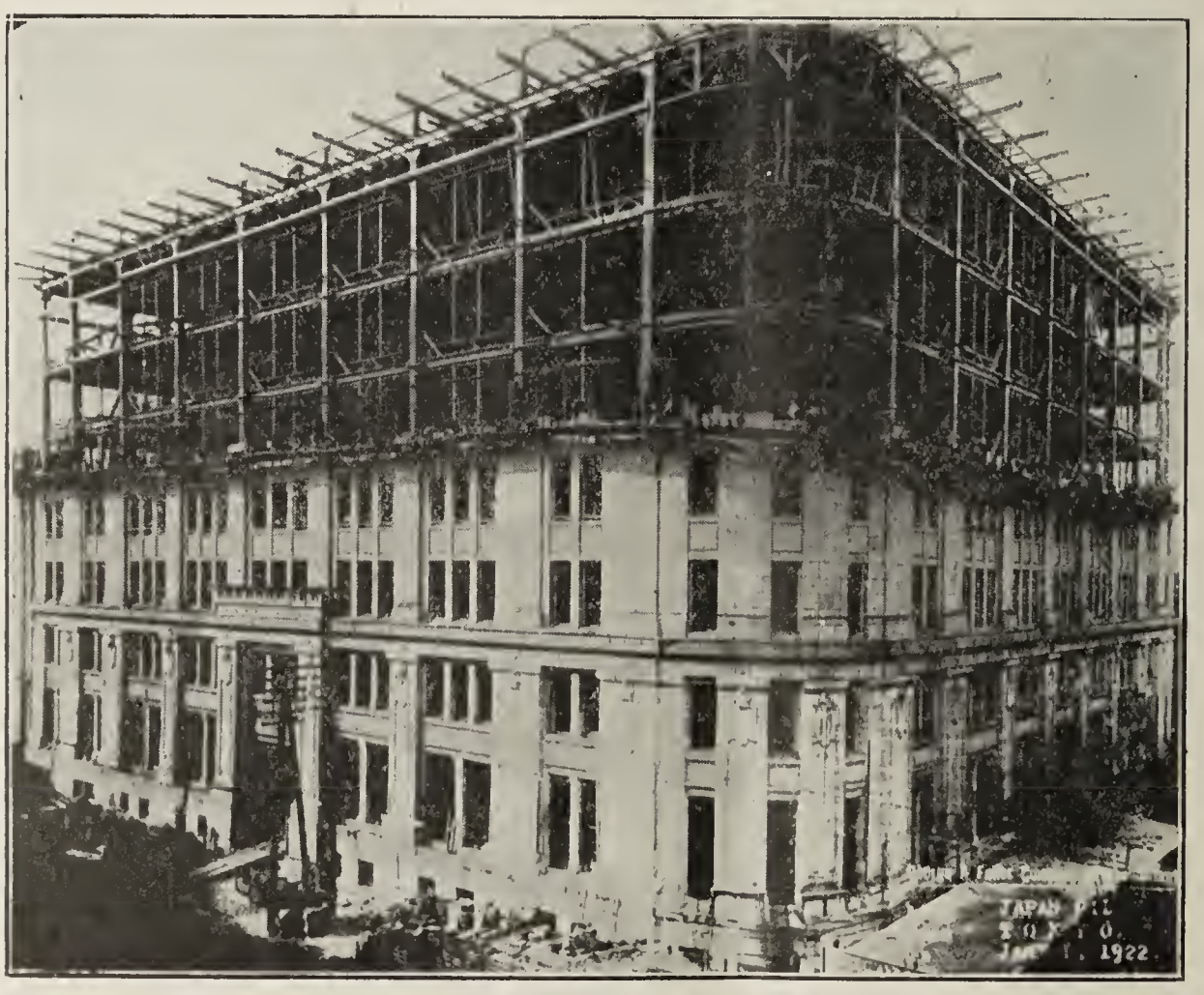
It is the opinion of the Commerce Department official who is most familiar with conditions in Japan that unless an acute shortage of cement develops which cannot be made up by increasing the capacity of Japanese plants, there will not be much opportunity for American cement producers to find a market there. The Japanese plants are said to produce a high quality of Portland cement. American cement producers, it is presumed with their higher labor costs and with the added handicap of the freight charge on this heavy commodity across the Pacific Ocean, would scarcely be able to deliver cement for Japanese use at prices anywhere near those of the domestic product. If an enormous demand for cement should develop, which the Japanese producers were not able to take care of, there of course might be a market for American cement. The opinion of Department of Commerce officials, based only on their knowledge of general conditions, is that this is not likely to happen.

One important factor in the situation on which definite information is lacking is the extent to which the Japanese cement producing industry has been damaged by the earthquake. Reports received by the Department of Commerce since the earthquake mention the destruction of only one cement factory. This was a factory of the Asano Portland Cement Company at Kawasaki. While this company is the largest cement producer in Japan it has a number of factories located in the principal cities and it is believed that the output of the factory which is known to have been destroyed was comparatively small. It is regarded as likely that other cement plants, including possibly some in Tokyo, also were destroyed but no definite information on this point is at hand. The impression seems to be, however, that factories producing the bulk of the output of Japan were not destroyed and that it will be possible to enlarge their capacity to take care of the increased demand for cement. One way to provide for an increased domestic consumption might be to curtail the quite considerable export business of the Japanese cement producers.

Import Duties Removed

Portland cement is included in a long list of commodities on which Japan has removed all import duties until March 31, 1924. Other commodities on which duties have been removed temporarily in order to encourage their importation include foodstuffs, clothing and various manufactures, such as construction and electrical materials. In the list are slate and manufactures thereof; brick, including cement bricks; tiles of clay; plate or sheet glass and other glass; iron and steel manufactures; materials for railroad construction; and materials for construction of buildings, bridges, docks, etc., not otherwise provided for.

Japanese cement plants produced in 1921 7,686,135 barrels of cement. The total value of the product was 49,042,378



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One of the American built structures which withstood Japanese disaster. Note careful bracing of the steel work.

yen, a yen being equal to 50 cents. There were at that time thirty factories employing 8,639 workers.

Thirty Japanese Cement Plants

Most of the cement factories are controlled by three leading companies. The Asano Portland Cement Company, the largest company, has a capital of 33,000,000 yen and an annual output of 6,700,000 barrels. This company evidently produces the bulk of all of the cement manufactured in Japan. The head office of the Asano company is in Tokyo, while factories are located at a number of points, including the one destroyed at Kawasaki.

The next largest company is the Qwaki Cement Company, located in Tokyo. This company has a capital of 3,000,000 yen. The Nippon Cement Company, also located in Tokyo, has a capital of 2,500,000 yen.

Japanese producers in the first six months of the year 1923 exported 514,354 piculs of cement. A picul is equal to 133 pounds. The six months' exports would be equal to 68,409,082 pounds. The exports for the six months of 1923 were considerably less than in the corresponding period of 1922, when the total was 994,646 piculs.

Exports of cement for the entire calendar year 1922 amounted to 1,738,038 piculs. This total was a decline from the exports of preceding months, the total in 1921 being 2,839,089 piculs and in 1920, 3,309,533 piculs.

The Philippines have furnished the largest export market for Japanese cement with Manchuria and China following closely. In 1922 cement exported from Japan to the Philippines amounted to 470,767 piculs, while in the same year exports to Dairen in South Manchuria amounted to 454,219 piculs, and to China proper, 437,685 piculs. Exports in that year to the Dutch East Indies amounted to 245,157 piculs, to British India 88,544 piculs, and to other countries 41,670 piculs.

The Far Eastern Division of the Bureau of Foreign and Domestic Commerce in a statement relative to Japanese reconstruction says that housing operations as America knows them even in war times appear insignificant beside the scope of the building operations Japan now faces in reconstructing the great cities of Tokyo and Yokohama. The latest reports place the destruction of buildings in the davastated areas at 316,000 in Tokyo, or about 71 per cent of the total number in that city, while in Yokohama out of the 85,000 buildings standing before the disaster only 15,000 are left intact. The Far Eastern Division estimates that the destruction in the outlying district may bring the total of buildings destroyed up to the half million mark, the large majority of which are homes. This number added to the housing shortage that existed in Japan before the earthquake will necessitate the construction of dwelling houses on a large scale.

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Showing ruins of Fiji Cotton Mills. Five hundred girls lost their lives in this plant when earthquake crushed light native construction.

Lumber in Demand

The statement issued by the Far Eastern Division, while relating chiefly to the demand in prospect for American lumber gives some interesting sidelights on the general construction situation.

"Since Japan normally looks to the United States for about 60 per cent of its lumber requirements it is expected that the demand for American lumber during the reconstruction period will be very heavy," says the statement.

"The price of Japanese lumber delivered c. i. f. Yokohama or Tokyo has been approximately 20 per cent higher than that of similar qualities of American lumber, and American freight rates have been favorable. The American market also finds itself in a favorable position as regards delivery. It often happens that the Japanese importer can secure delivery from Pacific ports to Yokohama in less time than from Hokkaido, Karafuto, or even from the northern Provinces of Japan proper.

"The principal lumber imports of Japan consist of fir, hemlock, pine, and cedar, about half of which is imported in large squares of from twelve to 24 inches and a lesser amount in small squares of 4½ inches. The large squares are worked up in the local mills and carpenter shops into the different shapes required for general building, while the smaller squares are used as studs for holding up roofs and for supporting beams. The large squares are very popular among builders in Japan and can only be obtained from America.

"The only competition confronting the United States in trade in this class of lumber will come from other parts of North America, as the Siberian, Manchurian, Hokkaido, and Saghalien or Karufuto pines and cedars are all of inferior quality and accepted only as substitutes for Japanese and American woods.

"At the time of the disaster stocks of lumber in Japan were quite large, especially in Kobe, Osaka and Tokyo. Assuming that all the stocks in Yokohama and Tokyo were destroyed, it is seen that there is still a fairly good supply on hand for immediate emergency purposes. The real demand will come when the permanent construction of the devastated areas commences. The requirements for home building will no doubt be satisfied first and will take the largest share of the lumber imports.

"In comparison with our own homes little wood is required for the construction of Japanese dwellings, in which paper, straw, matting and tile (for roofing) play a large part, but during recent years the tendency has been toward a greater use of wood, especially for ceilings and interiors, as the Japanese are very fond of polished wood in its natural colors. In this respect our lumber has lent itself very admirably owing to its superior quality.

Not Built for Permanence

"In rebuilding the residential sections of the cities which were visited by the disaster every economy will be practiced and the use of wood will be limited in every possible way. Despite these attempts to save, large quantities of lumber will be needed.

"Piling will be required in large numbers for reconstructing the destroyed docks and waterside warehouses and sheds in Yokohama and Tokyo, as well as for building subfoundations for industrial buildings, bridges, and construction work in general. The city of Tokyo for some time has contemplated the widening and straightening of its narrow, crowded streets, and many have already been designated for this improvement. This plan will no doubt be carried out in the reconstruction program and the widening of the streets will require enormous quantities of paving blocks. Douglas fir has been used almost exclusively in the paving program of Tokyo.

"It is reported that plans are being made to rebuild Tokyo and Yokohama along modern lines, conforming with the construction of the Western World as closely as practicable. The possibilities along this line are somewhat limited, however, owing to the necessity of always keeping in mind the probability of a recurrence of earthquakes and designing the buildings accordingly, and the necessity of keeping the cost within limits, especially in the case of homes. It is certain, however, that in a short time better and finer cities will rise from the ashes of Tokyo and Yokohama, and that they will regain the prominent positions in Japanese affairs that they enjoyed before the disaster."

Concrete Coaling Plants Are Efficient Structures

Locomotive Coaling Facilities Made Entirely of Concrete Are Among the Permanent Improvements of the Present Day

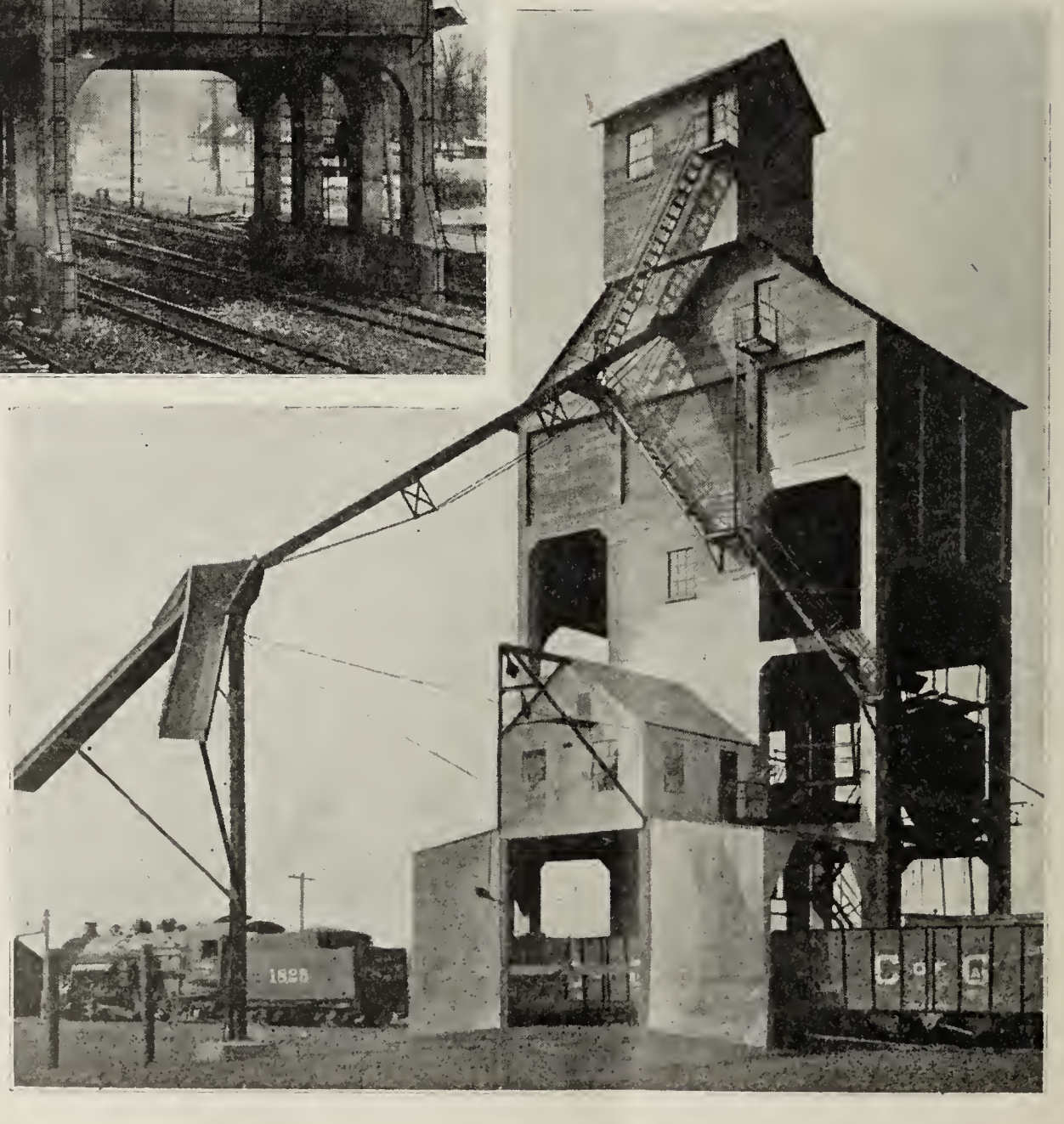
A locomotive coaling plant which includes the latest developments in that class of facilities has lately been completed for the Michigan Central R. R., at Michigan City, Ind., by the Roberts & Schaefer Co., engineers and contractors, Chicago. The structure is located on the main line of the Michigan Central, and it serves four tracks. It is constructed of solid poured reinforced concrete throughout.

One of the unusual features of this pocket is that the elevator bucket travels over a curved concrete runway and up a tower inclined from the vertical, discharging the coal from the bucket directly over the pocket. This inclined runway is all concrete. The coal pocket is built without plastered reinforcing or corrugated iron covering, the structure being solid poured in forms, including the roofs.

The coal is received in gondola cars which discharge into an all concrete track hopper, twenty-five feet long. This is provided with concrete walkways at the side of the receiving track to enable the operators to reach the car doors for the purpose of releasing them to unload the coal. From the hopper the coal is delivered to a measuring feeder which is so arranged that the coal cannot overflow into the pit when it is discharged into the elevating bucket.

This elevating bucket is hoisted by an automatic electric hoist which is located at the operator's house. The returning cable passes up the tower and is attracted to a balancing concrete counterweight which operates on heavy flanged rollers on thirty pound rails on the back of the tower. This counterweight balances the elevating bucket. A novel arrangement of this coal socket is a double roll coal crusher built by the Link-Belt Company and which is located overhead and above the 500 ton concrete pocket. This crusher breaks mine run coal into four inch cubes for the locomotive and such is the strength of the construction of the pocket that there is no vibration whatever caused by the operation of the coal crusher.

A reinforced concrete canopy protects the men unloading the coal from the weather. Another feature of this coaling station is the sand storage and drying plant, which consists of a reinforced concrete bulkhead on the ground level. Similar plants are being built by the Roberts & Schaefer Company for the Delaware



Above — Concrete locomotive coaling plant of Michigan Central R. R. at Michigan City, Ind.
At right—6,000-ton plant of Central of Georgia R. R. at Columbus, Ga.

& Hudson railway, Chesapeake & Ohio railway and the Richmond Fredericksburg & Potomac railroad.

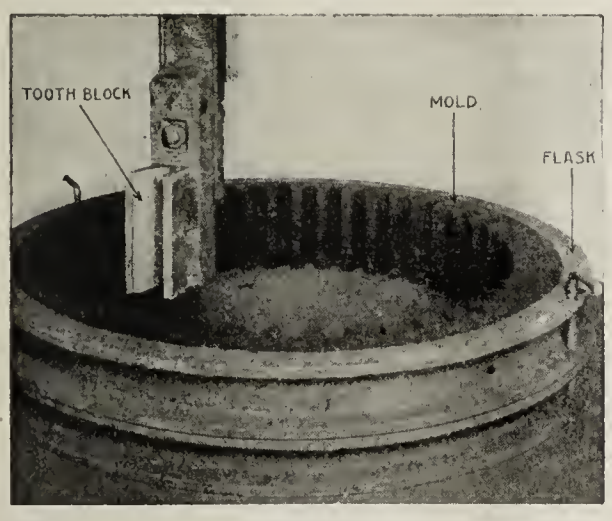
We also show an illustration of a reinforced concrete coaling station with a ground storage feature, recently completed for the Central of Georgia railway at Columbus, Ga., and built by the Ogle Construction Company of Chicago. The storage capacity of the plant is 6,000 tons. Five hundred of these is in the pockets and an area is provided for 5,500 tons of coal which is piled in a storage pile averaging 12 feet.

Except for the shed over the receiving hopper, the entire structure from foundations to roof is of poured reinforced concrete. Although water and quicksand were encountered in excavating, the excavation for the bucket pits was carried to a depth of twenty-three feet below grade without the loss of a shovelful of material or the slightest deflection in the pit sheeting. The bucket pits and receiving hopper are 1-2-4 concrete, poured monolithically, and watertight. No waterproofing compound or material of any kind was employed. The receiving hopper and storage bin floor slopes are well trowelled to a hard, smooth finish. All valleys are well rounded and valley slopes have sufficient pitch to insure free flow of coal to the outlets. The roofs of the main and auxiliary structures are of reinforced concrete, formed and poured. The hoppers are of monolithic reinforced concrete. The ground storage is reclaimed in a one and one-half cubic yard capacity crescent type bottomless scraper, operated by a fifty h. p. Westinghouse motor. This drag line equipment was designed and manufactured by Sauerman Bros., of Chicago. The automatic machinery for elevating the coal and the coal and sand delivery fixtures were designed and manufactured by the Ogle Construction Company which installed all of the machinery.

Machine Molded Gears Made of Cast Iron

When a molded, grey iron gear, fourteen feet in diameter and with an 18 inch face, is so well made that after completion the gear is found to be less than one-sixteenth of one inch out-of-round, and each tooth to be exact in pitch, the process of manufacture is worthy of note. The gear in point was made for a cement mill—a service demanding the very best in workmanship and materials, because of the ever present dust and grit in such mills.

Molding this gear by the pattern method would not only be equally expensive, but the method would carry with it the risk of error in pitch and roundness. Hence the process of machine molding was employed—a process well illustrated by the accompanying photograph. This process molds one tooth at a time, the "pattern" being a "single tooth block," ordinarily made of brass, and machined to absolute accuracy. The tooth block is mounted on



Showing the gear making machine.

the ram of the gear molding machine. This ram, or head is adjustable, so as to give the correct pitch diameter. The ram is also moveable up and down, so as to bring the tooth block in position for holding the teeth, and so it can be removed while the table is being rotated.

The flask is placed on the table of the machine and properly centered. The table of the machine is rotated by hand, through a series of gears. This gives the table a slow action and enables it accurately to index the proper number of teeth. The tooth block is then withdrawn from the flask, and the table rotated the exact amount necessary to bring it in position for the next tooth. This process is repeated until all the teeth have been so molded. The arms are made in cores, or in green sand, depending somewhat on the size of the gears, etc. The making of the arms differs in no way from ordinary molding.

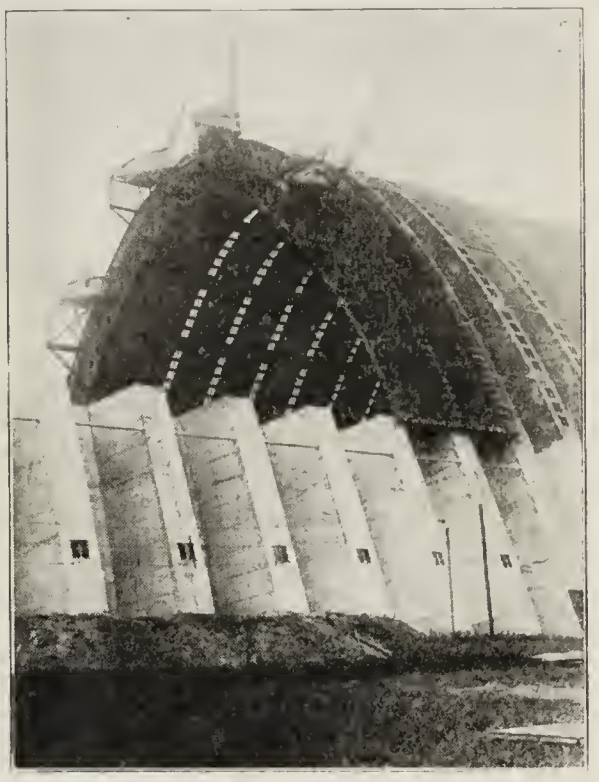
Because of the fact that the teeth are accurately indexed and the single tooth pattern has no draft, being drawn up through a stripping plate, and because more time can be spent on a single tooth than it would be possible to spend on each tooth of a full pattern, the machine molded gear is necessarily very much more accurate than any pattern molded gear could be. And, though it might appear that machine molded gears would be far more costly than pattern molded, the opposite is true, especially in the cases of the larger sizes.

Have Necessary Hardness

All these gears are made from a special mixture, ranging on the average about 20 per cent steel and 80 per cent grey iron. This very materially increases the tensile strength of the final product. Grey iron ordinarily possesses a tensile strength of 18,000 to 20,000 pounds per square inch of cross section while the mixture including steel will raise this tensile strength to 25,000 or more.

Machine molded gears have a surface chill and hardness to resist wear that cut gears do not have, by reason of the fact that the surfaces of cut gears are whittled away. Very often this hard, chill surface extends one-eighth of an inch under the surface, which of course insures longer life and a better wearing surface. It is interesting to note that many of the larger cement mills which for the past few years entirely forsook the cast iron gears in favor of steel gears are now returning to the machine molded cast iron products. It has been found that in spite of the harder material which comprises the steel product, the dust and grit encountered in cement plants wear away the steel just as rapidly as they do the grey iron. Hence the far greater expense for steel gears is not justified. The accuracy with which machine molded gears are made tends to decrease the power input and lengthen the life of the machine or mill being operated. The fourteen foot gear shown was made by the H. W. Caldwell & Son Company plant of the Link-Belt Company of Chicago.

The Westinghouse Electric & Manufacturing Company has issued a new catalogue covering line material and porcelain insulators. The catalogue is supplementary to the company's large supply catalogue and has been issued for the convenience of purchasers of these two allied lines of materials. It is a 200 page publication of convenient size, is fully illustrated, and contains a complete description of all the company's line material and porcelain insulators.



This shows a section of what is to be the largest dirigible hangar in the world, under construction at Orly, near Fontainbleau, France, which stands more than 196 feet high and measures 295 feet in length. It is being constructed of concrete and steel at the rate of one arc a week. Note concrete base upon which steel arcs are set.

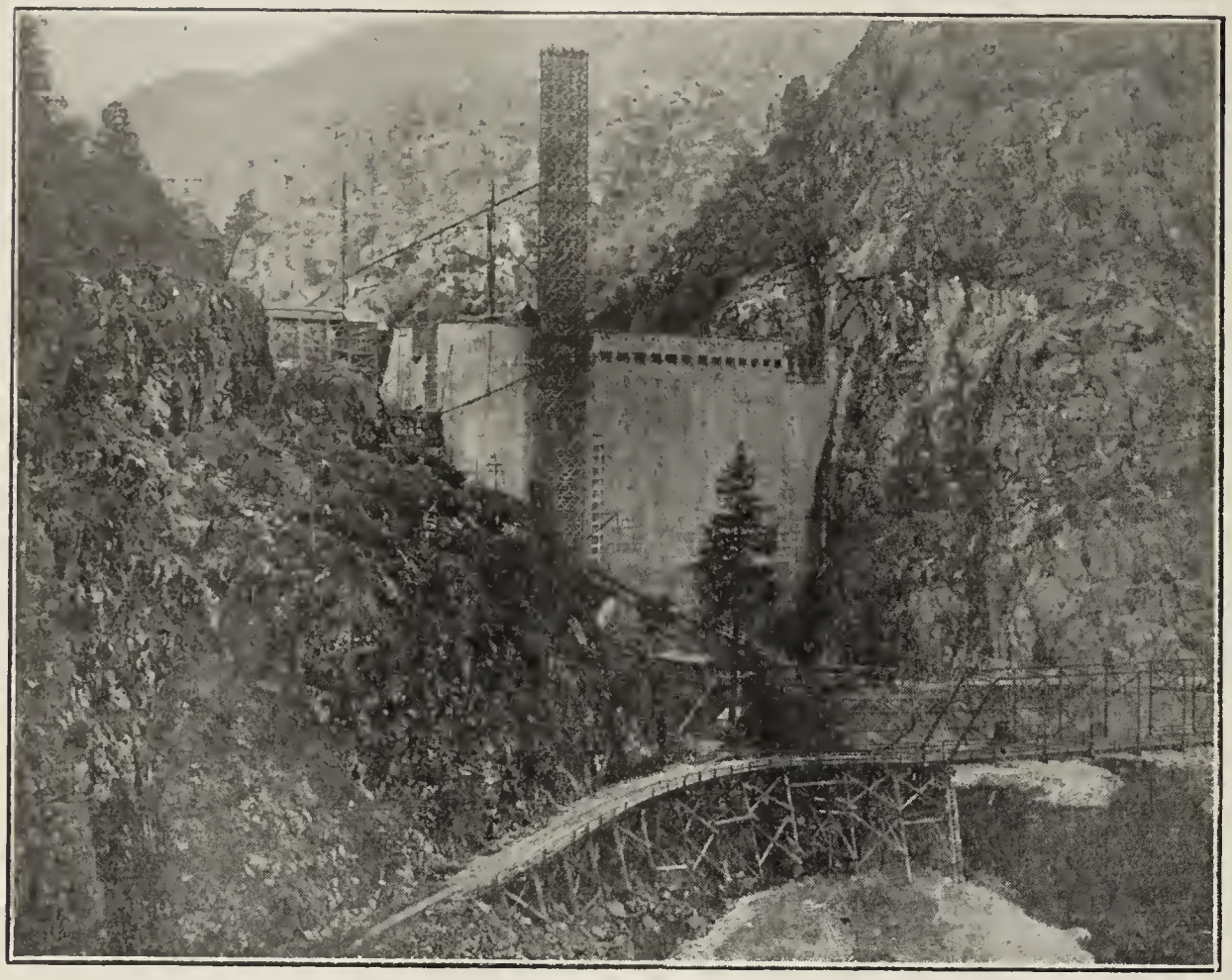
WASHINGTON, September 28.—All building materials will be exempted by Japan from import duties, according to a cablegram received by the Japanese Embassy. This is one of several emergency measures approved by the Privy Council of the Emperor as a means of facilitating reconstruction following the earthquake.

Materials imported into Mexico for use in irrigation or hydraulic work on a large scale will be exempt from import duties and consular fees, Consul T. D. Bowman reports to the Department of Commerce.

WASHINGTON, September 28.—The Federal Power Commission has authorized the issuance of a license to the Superior Portland Cement Company for a minor part of a complete project on Jackman Creek, Skagit County, Washington, consisting of a diversion dam in the stream at a point about three miles above Van Horn, Washington, a conduit two and one-half miles long with a capacity of 55 cubic feet per second, a power house, and a transmission line connecting the latter with the cement mill of the applicant. The power developed will be used for lighting purposes and for operating the cement works of the applicant.

San Francisco Completes Giant Masonry Dam

The City of San Francisco has just completed one of the largest masonry dams in the world, in connection with the Hetch Hetchy Water and Power Project. The dam has been named O'Shaughnessy Dam in honor of the engineer who built it. Approximately 390,000 cubic yards of concrete were used in the construction of the dam. It will ultimately stand 312 feet above the bed of the stream. The length along the crest is now 700 feet.



Downstream view of dam construction, showing concrete delivery tower.

Hetch Hetchy Valley was formed by glacial action which scoured the bowl out of solid granite. The power of the glacier was broken when it crushed against the narrow gorge at the lower end of the valley. A waterfall eventually cut down through the rock, making the narrow gorge which has just been closed by the dam.

Large groove pot holes were disclosed in the bottom of the excavation for the dam, which were formed by water action of cascades from ancient glaciers, millions of years ago, which discharged over the precipices at distant times and grooved out circular caverns in the solid granite. It was only necessary to use a sand blast and scrubbing brushes to clean the scum off the ancient surface to make a desirable contact for new construction.

The lake formed by the dam now extends 7½ miles up the floor of the Hetch Hetchy Valley and covers 1,500 acres. The Hetch Hetchy water and power project is primarily a project to bring four hundred million gallons of water daily from the Tuolumne river to San Francisco and its vicinity. The points at which water enters the Hetch Hetchy system are at such an elevation that transmission through the entire 156 miles of aqueduct will be accomplished by gravity and leave a surplus of energy. The combination of a hydro-electric power system with the water supply system is therefore an economical one, so that all of the surplus energy will eventually be used to generate power.

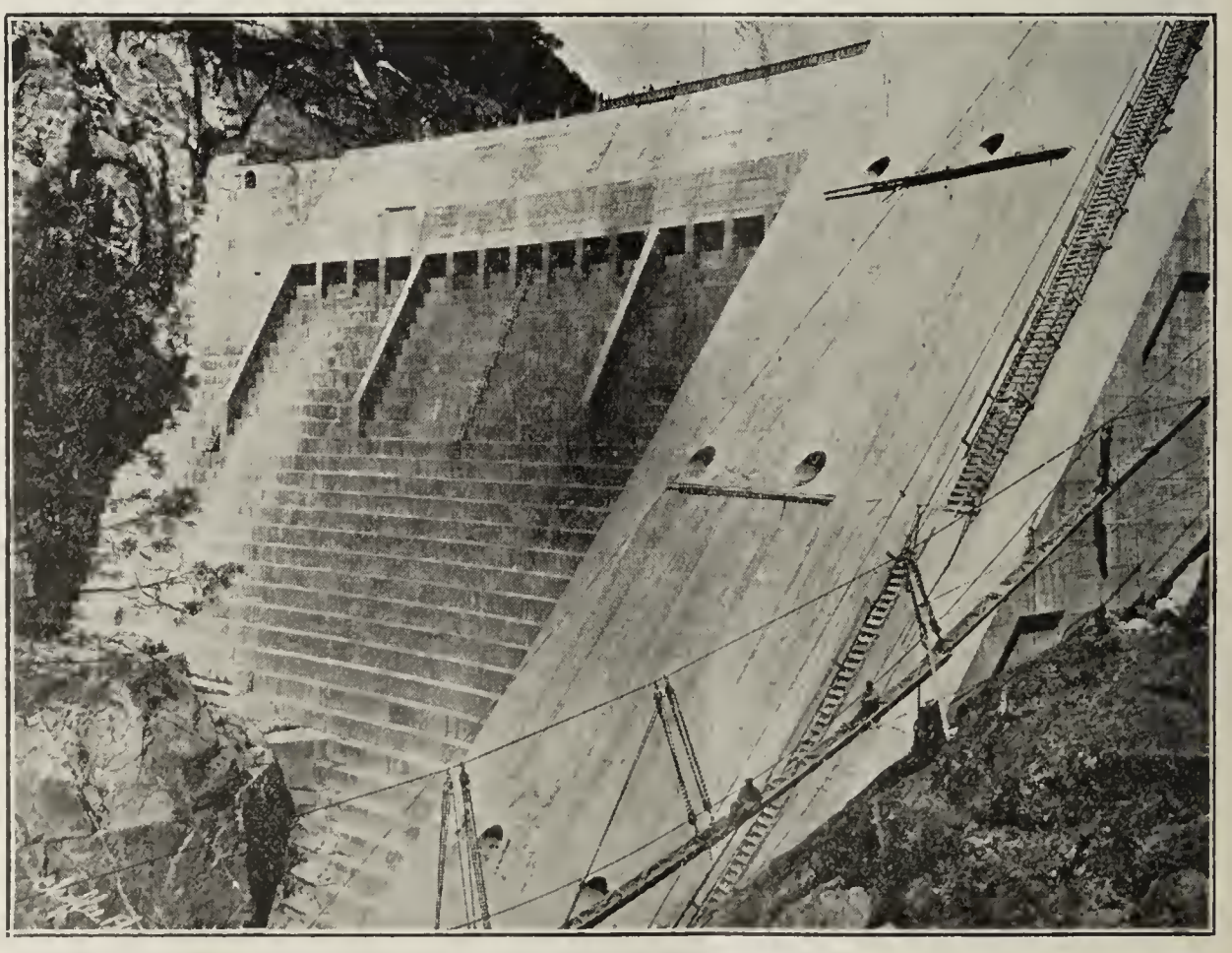
The city is now constructing a great concrete hydro-electric power house at Moccasin Creek as an auxiliary of the Hetch Hetchy water supply project. Into the structure has been incorporated all of the beauty in design of the old California missions. When completed the concrete structure will be 300 feet in length and almost 100 feet wide. It is located in the Sierra mountains at the foot of high hills down which the water from the Hetch Hetchy system will plunge through penstocks leading out of the Priest reservoir at the end of the mountain division of the tunnels.

Four Supplementary Dams Built

To reach the foundations of the Hetch Hetchy dam four supplementary dams were necessary: First, a log crib dam about 200 feet above the main dam, which consisted of 12x12 inch logs with iron rods bolted together into a mass and interstices filled with rock designed to take the water to the diversion tunnel. The next dam was on the down stream side above the lower end of the diversion tunnel to stop the water from backing into the foundation pit.

Excavation was then made with dinky locomotives and steam shovels below the streambed and two additional slender concrete dams were made at a depth of about 40 feet to intercept the gravel and water coming into the foundation until the bottom was reached. The river was bypassed from the site of the dam foundation by means of a diversion tunnel 23 by 25 feet wide, and 1,000 feet long, and carried in a curved alignment through the mountain side south of the dam.

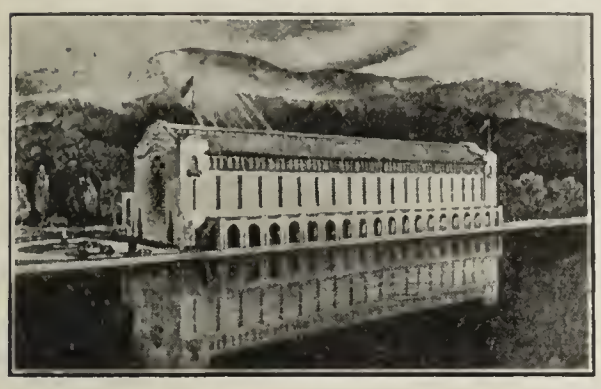
For several years the water will be permitted to flow down the natural streambed a distance of twelve miles to Early Intake, to be there diverted by means of a small arch dam into a tunnel about thirteen feet in diameter 18½ miles long, which leads the water to Priest forebay reservoir. At Priest a forebay reservoir is being built through a spur of the mountain and connected to Moccasin Creek power house, now under construction, and ultimately to comprise six main generating units. These units



During ordinary levels of the reservoir the water is allowed to flow through the dam by a series of six five-foot gate valves, the outlets of which are here shown. The overflow water from siphon spillway flows over series of stipples at left.

will be 20,000 KVA, 11,000 volt electric generators, each driven by two impulse waterwheels, aggregating 25,000 H. P. capacity, overhung on the shaft on opposite sides of the generator.

Engineers throughout the country



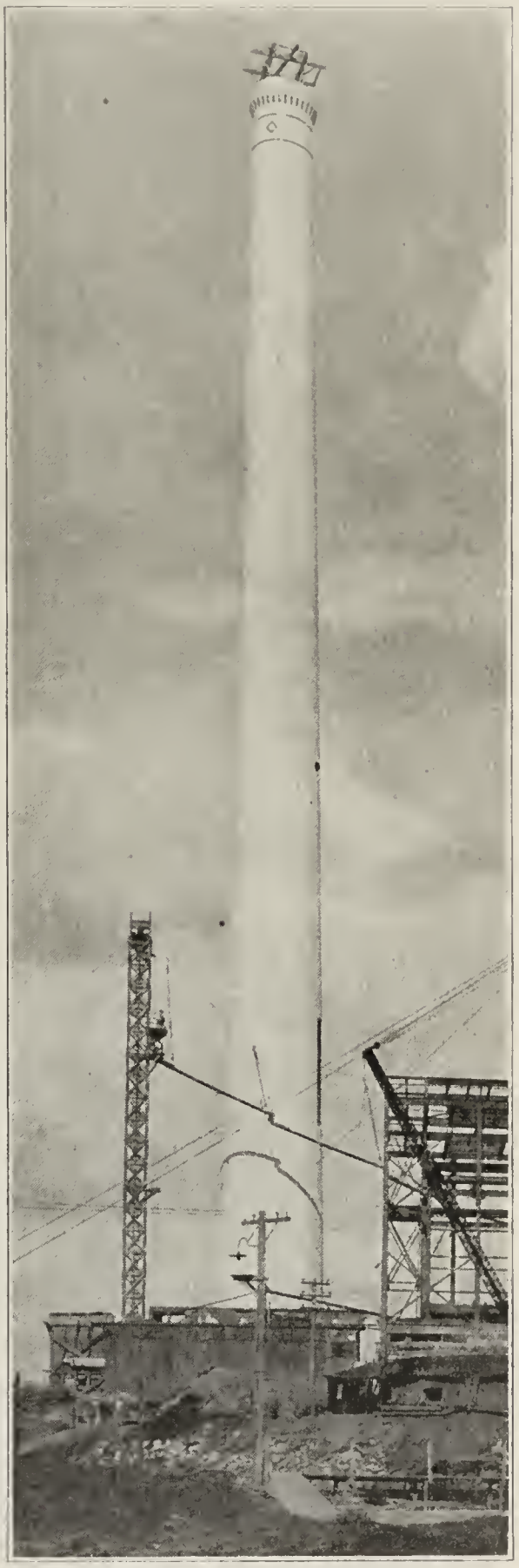
Proposed Moccasin Creek power house of the Hetch Hetchy project.

are interested in the construction of the Priest dam. It is of the earth fill type and is said to be the third largest dam of that type in the country.

Tallest in America

That concrete structures may be made slim and graceful as well as serviceable and permanent is again proven in the new concrete chimney recently completed at the enlarged plant of the Dallas Power and Light Company, of Dallas, Texas. The fact that it rises 363½ feet from the ground gives it claim to being the tallest all concrete structure in America and the second tallest in the world. When the Weber Chimney Company, of Chicago, built a concrete stack 570 feet high for the Saganoseki Copper Company smelting plant at Saganoseki, Japan, it set a record for height which has not, it seems, been reached yet by chimneys made of any material. But stacks as tall as this are more rare in America. One of the Montana copper smelters near Butte sometime ago erected a radial brick stack 550 feet high, the only chimney in America taller than the concrete one at Dallas.

The new concrete chimney, towering 363½ feet above the base, is thirty-two feet in outside diameter at the ground and sixteen feet at the top, with a collar near the top eighteen feet in diameter. The inside flue opening tapers from twenty-eight feet at the bottom



This stack is 363½ feet long.

to fourteen feet at the tip. The base of the structure rests upon solid rock, and consists of a solid block of concrete fifty feet in diameter and five feet thick, containing 385 cubic yards of concrete and nearly twelve tons of reinforcing steel. The chimney proper contains about 800 cubic yards of concrete and about sixty tons of reinforcing steel. It supplants three old smokestacks and provides extra facilities for recent enlargements and improvement of the plant boiler capacity.

The chimney was planned and erected by the Heine Chimney Company of Chicago, about four months being required for its completion.

Pulverizing Mill Makes Good Record

The accompanying mill was installed by the Kennedy-Van Saun Manufacturing and Engineering Corporation at the E. J. Lavino plant near Paoli, Pa. The intention was to pulverize limestone for agricultural purposes and also finer ground limestone for asphalt filler. It consisted of an elevator delivering the ¾ inch stone and finer to a tower dryer and from the tower dryer the material was elevated to a bin in front of a 6 foot by 12 foot Airswept Tube Mill, which was charged with the following amount of forged steel balls: 1 ton of 2 inch, 1 ton of 3 inch, 1 ton of 4 inch, 5 tons of 1 inch.

Air boxes with valves on either side were provided and a 60 inch fan driven by a 25 H. P. variable speed motor was direct connected through a flexible coupling. The speed was about 600; the power consumed about 12 H. P. The mill is driven with a 125 H. P. motor. The power required was about 120 H. P. The separating equipment consisted of a 7 inch preliminary cyclone and the secondary was a 10 inch cyclone with a 4 inch auxiliary cyclone. The air from the 10 inch cyclone was returned to the feed end of the mill.

The mill was started and the fan set at approximately 650 R. P. M., and the capacity was 11.8 tons per hour. The material taken from the 7 inch cyclone was as follows: 84.5 through 200 mesh, 94.8 through 150 mesh, 99.2 through 100 mesh. The material from the large cyclone all went through a 350 mesh sieve.

It will be noted that this was the equivalent to approximately 38 barrels per hour of cement product. This is considered quite a record as a ton of material was ground for less than 12 H. P.

New Publications

The Fate-Root-Heath Company, of Plymouth, Ohio, manufacturers of Plymouth gasoline locomotives, has just issued a new booklet, Bulletin D, which describes the use of its equipment in general construction work. The bulletin, thirty-two pages in length, is printed in attractive style and shows the Plymouth locomotive being used on a large variety of construction jobs. "Sell it with pictures" seems to have been the idea of the author of the booklet, with the result that he has produced an interesting piece of work.

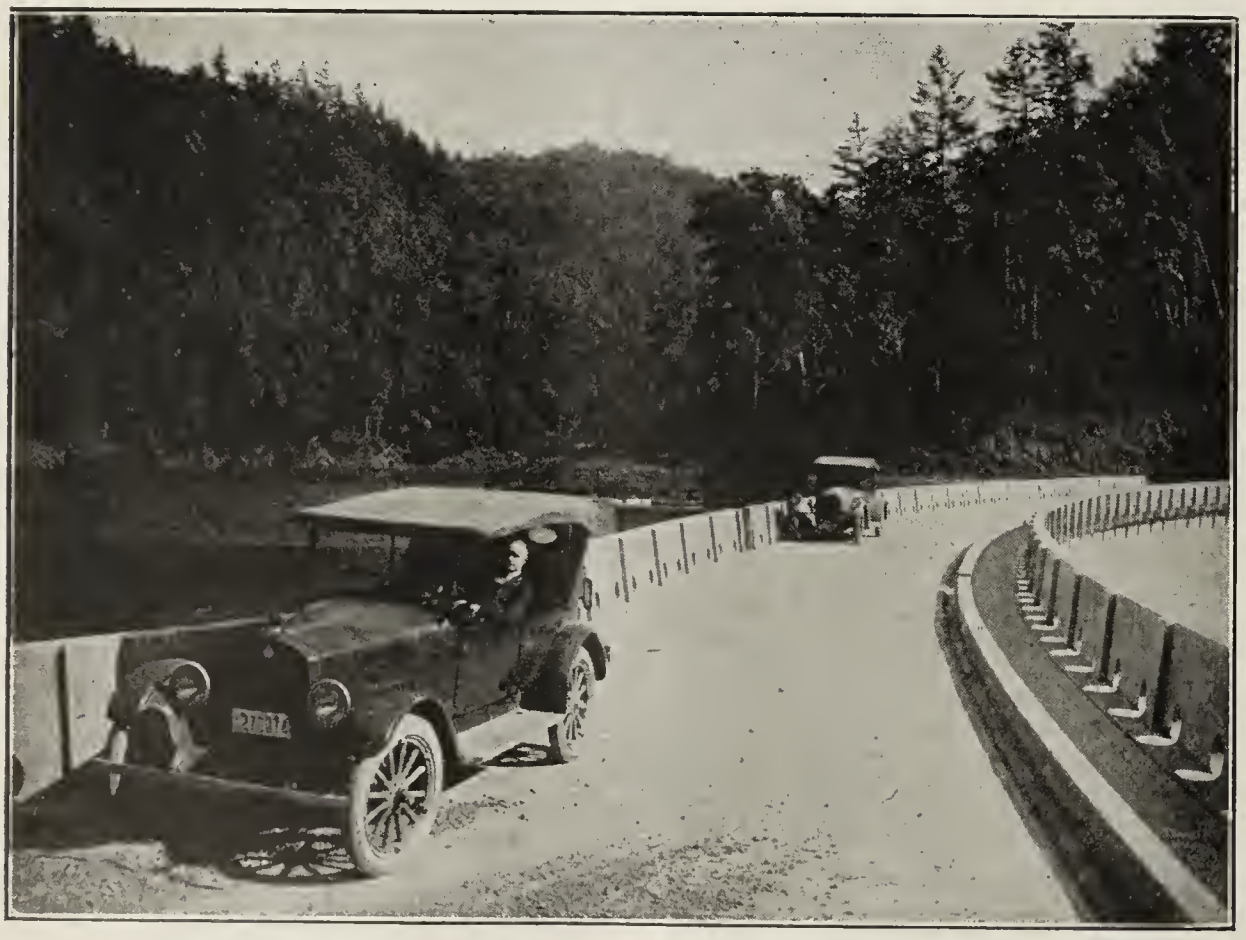
The Sullivan Machinery Company, with offices at 122 South Michigan, Chicago, and with a new plant at Michigan City, Indiana, has just issued three new bulletins describing some of its equipment. The first, Bulletin 72-H, takes up the question of Sullivan drill sharpeners for hammer forging drill bits and shanks. It is, like its two companions, of pocket size. It contains thirty-two pages of illustrations and valuable information. Bulletin 77-G, replacing 77-C, describes the "WA-6" air compressors, which are of the straight line type, with simple steam and air cylinders and "Wafer" air valves. It contains eight pages. Bulletin 81-B takes up the matter of Sullivan rotators. It is thirty-two pages in length and contains a complete survey of this type of machinery.

The Brown Instrument Company of Philadelphia, Pa., has put on the market a new carbon dioxide meter which measures electrically the percentage of carbon dioxide in flue gas. This instrument works on the principle of the difference in thermal conductivity of various gases instead of on the principle of chemical analysis. Catalog No. 30, illustrating this device and its use, has recently been issued.

The Anchor Concrete Machinery Company of Columbus, Ohio, has issued a leaflet telling of the use of the Anchor Stripper machine in making the blocks for the famous Hoover "Home Sweet Home" in Washington. The structure, it will be remembered, sprang into national prominent last May while it was being erected.

The Bertha-Consumers Company, 1203 Chamber of Commerce Bldg., Pittsburgh, Pa., in its recent numbers of the Bertha-Consumers Coal Bulletin, has taken up quite in detail the matter of the use of its coal in big cement plants of the United States, laying especial emphasis on the installations of the sixteen plants of the Lehigh Portland Cement Company and of the Lawrence Portland Cement Company. In stressing the largeness of the cement industry, one issue has this to say: "No reference has been made to the immense quantities of materials required to operate these mills. Unfortunately space will permit but a brief review here. Thousands of tons of blasting powder, millions of tons of coal and rock, mountains of sacks and thousands of employees are all necessary. The following will give you some idea of the public demand for Lehigh Cement and the coal required to manufacture it. In the year 1922, 12,801,463 barrels of Lehigh Cement were manufactured and 997,856.14 tons of coal were consumed."

The booklets go on to describe the cement industry and its great proportions in general and the plants of the Lehigh and Lawrence Companies in particular. As a matter of fact, each of the twelve illustrated pages in each issue carries interesting and valuable information for the cement man.



Dam for Highway

The necessity of building a highway bridge is eliminated by extending the highway over the top of the Alpine Dam in Marine county, California, as shown in the accompanying photo. Before the dam was built the highway extended along the valley which was converted into a lake when the Alpine Dam was constructed. It was necessary to build a new roadway and instead of constructing a bridge to carry the road over the lake a highway was built over the top of the dam, for the accommodation of vehicular traffic and pedestrians.

"Own Your Home," Plea

WASHINGTON, September 28.—The Department of Commerce has issued a handbook designed for the prospective small home owner. The book is entitled "How to Own Your Home." It carries a foreword by Herbert Hoover, Secretary of Commerce, and was compiled by John M. Gries and James S. Taylor, of the Division of Building and Housing, in answer the request of a large number of national civic organizations that the subject should be authoritatively covered to encourage home owning in the interest of good citizenship.

In declaring that the public recognizes the advantage of owning their own homes and that business groups, especially, are viewing this proposition in a new light, Secretary Hoover said in the foreword:

"They see that taking a neighborly interest in developing sound financing and other machinery for the use of home seekers and insisting on the observance of honest, straight-forward business methods by those who deal with home seekers is not paternalism but good business and good citizenship. It is the 'square deal,' and it is not only right but essential that the cards should not be stacked against the home seeker."

Maintaining a high percentage of individual home owners is one of the searching tests that now challenge the people of the United States, Secretary Hoover says in urging "the own-your-home" idea. "The present large proportion of families that own their homes is both the foundation of a sound economic and social system and a guarantee that our society will continue to develop rationally as changing conditions demand."

Statistics published in the book show the percentage of home owners in the United States, and the revelation made by them also prompted the Department of Commerce to publish such information for public use. In 1900, 461 of every 1,000 families in America owned their own homes, while in 1920 the percentage had dropped to 456 in each 1,000. Of the forty-eight states only twenty showed ar increase, while the District of Columbia likewise gained.

The ten leading states in respect to home ownership in 1920 were, in order, North Dakota, Wisconsin, South Dakota, Iowa, Minnesota, Montana, Utah, Maine, New Mexico and Michigan.

Tables dealing with the ratio of income to home investment are given. The tables do not attempt to set up arbitrary standards, although they are stated to be fairly typical and may be used as a basis from which to start figuring.

W. H. Merrill, president and founder of the Underwriters' Laboratories, Inc., died in Chicago on Sept. 17. He was fifty-five years of age and a graduate of the Massachusetts Institute of Technology. He had devoted his entire active career to fire protection and prevention work. During the war he was a dollar a year man, serving as chairman of the Fire Prevention Section of the War Industries Board.

The Coast Concrete Products and Building Company of Los Angeles, Cal., has recently begun production of building tiles in its new $100,000 plant.

Portland Cement Output in August

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for August, 1923, were made necessary by the lack of returns from four mills. Production and shipments in August are greater than in any month thus far recorded, and stocks are higher than in August, 1922.

Production, Shipments, and Stocks of Finished Portland Cement, by Districts in August, 1922 and 1923, and Stocks in July, 1923, in Barrels.

Commercial District	Production August		Shipments August		Stocks at end of August		Stocks at end of July,
	1922	1923	1922	1923	1922 (a)	1923	1923 (a)
Eastern Pa., N. J., & Md.	2,997,000	3,388,000	3,994,000	4,084,000	1,460,000	2,118,000	2,814,000
New York	596,000	720,000	811,000	823,000	518,000	552,000	655,000
Ohio, Western Pa. & W. Va.	1,156,000	1,295,000	1,491,000	1,606,000	679,000	451,000	762,000
Michigan	584,000	646,000	863,000	788,000	165,000	178,000	320,000
Ill., Ind. & Ky.	1,979,000	2,008,000	2,204,000	2,080,000	696,000	425,000	497,000
Va., Tenn., Ala. & Ga.	533,000	681,000	546,000	684,000	307,000	231,000	234,000
Eastern Mo., Ia., & Minn.	1,164,000	1,268,000	1,530,000	1,620,000	485,000	662,000	1,014,000
West. Mo., Neb., Kan. & Okla.	874,000	1.026,000	1,019,000	1,254,000	696,000	645,000	873,000
Texas	364,000	385,000	420,000	413,000	117,000	159,000	187,000
Colorado & Utah	279,000	231,000	279,000	275,000	175,000	115,000	159,000
California	799,000	1,009,000	818,000	958,000	216,000	220,000	169,000
Ore., Wash. & Mont.	339,000	310,000	386,000	386,000	232,000	321,000	397,000
	11,664,000	12,967,000	14,361,000	14,971,000	5,746,000	6,077,000	8,081,000

(a) Revised.

Stocks of clinker, or unground cement, at the mills at the end of August, 1923, amounted to about 3,727,000 barrels compared with 3,865,000 barrels at the beginning of the month.

Production, Shipments, and Stocks of Finished Portland Cement by Months in 1922 and 1923, in Barrels.

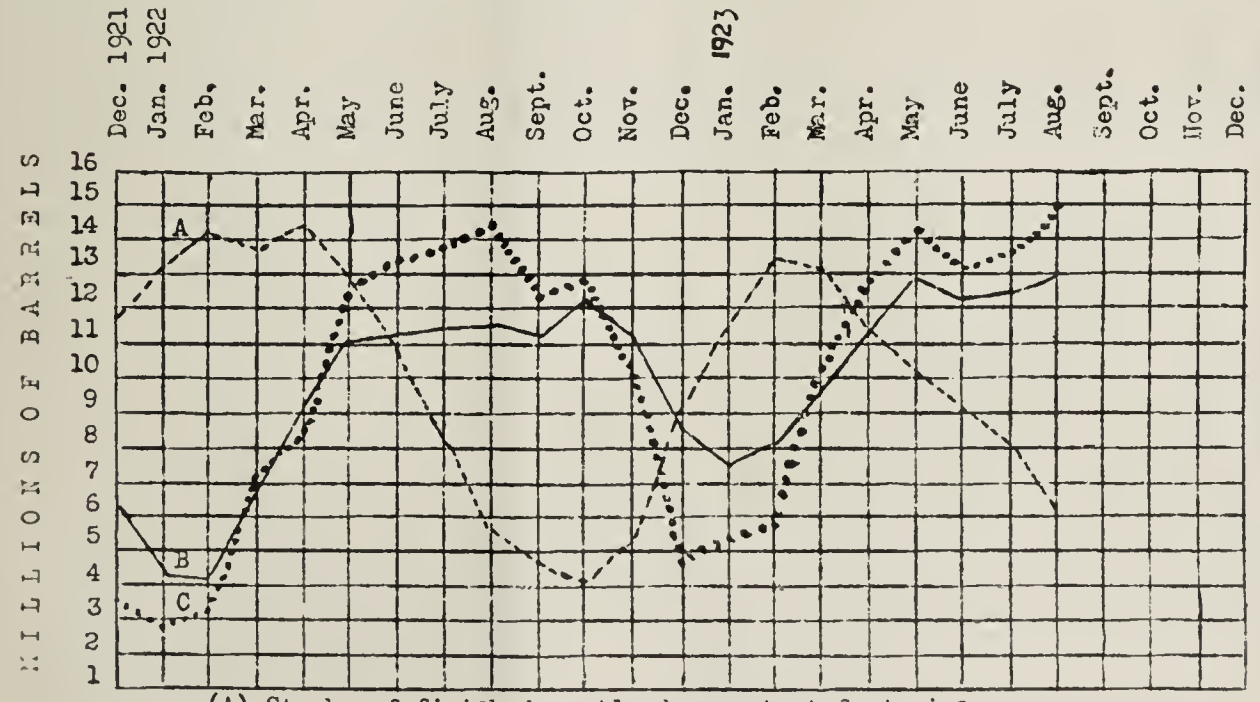
Month	Production		Shipments		Stocks at end of month	
	1922	1923	1922	1923	1922a	1923
January	a4,291,000	7,704,000	a2,931,000	5,419,000	13,316,000	a11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	a13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	13,848,000	a13,045,000
First quarter	15,254,000	25,669,000	13,218,000	21,708,000	.....	.....
April	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	a11,463,000
May	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	a10,144,000
June	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	a9,168,000
Second quarter	31,664,000	36,651,000	34,811,000	40,518,000	.....	.....
July	11,557,000	12,620,000	13,850,000	13,712,000	8,433,000	a8,801,000
August	11,664,000	12,967,000	14,361,000	14,971,000	5,746,000	6,077,000
September	11,424,000	.....	12,444,000	.....	4,724,000	.....

(a) Revised.

Imports and Exports of Hydraulic Cement, by Months, in 1922 and 1923, in Barrels. (a)

Month	Imports		Exports	
	1922	1923	1922	1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	111,559	96,263	77,203
July	957	286,106	119,491	82,774
August	56,757	(b)	105,156	(b)
September	c42,641	.....	78,615	.....
October	d65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	108,938	.....
	323,823	.....	1,127,845	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce. (b) Imports and exports in August, 1923, not available. (c) Covers period Sept. 1-21. Imports Sept. 22-30 included with October. (d) Includes imports period Sept. 22-30.


1921
1922
1923
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
MILLIONS OF BARRELS
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
A
B
C

(A) Stocks of finished portland cement at factories.
(B) Production of finished portland cement.
(C) Shipments of finished portland cement from factories.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in July, 1923, amounted to 286,106 barrels, valued at $555,166. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in July were: From Norway, 118,231 barrels; England, 52,765 barrels; Sweden, 44,764 barrels; Germany, 29,841 barrels; Quebec Province, Canada, 24,-521 barrels; Denmark, 13,535 barrels; British Columbia, 1,007 barrels; other countries, 1,442 barrels. The imports were received in the following districts: Los Angeles, 84,756 barrels; New Orleans, 41,798 barrels; Oregon, 39,451 barrels; San Francisco, 25,837 barrels; Hawaii, 15,626 barrels; Vermont, 15,245 barrels; Porto Rico, 13,535 barrels; North Carolina, 12,511 barrels; South Carolina 11,033 barrels; Florida, 10,449 barrels; other districts, 15,865 barrels.

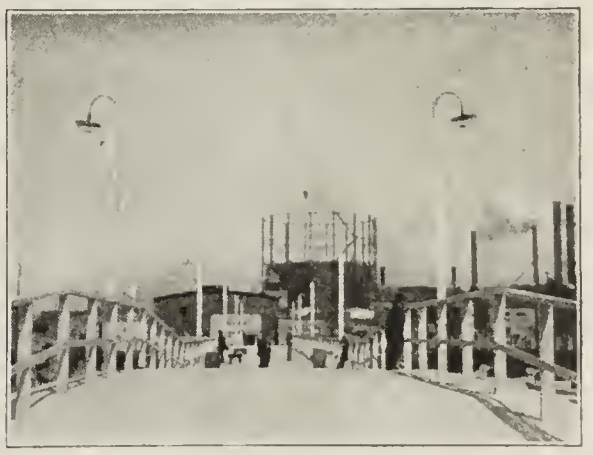
The exports of hydraulic cement in July, 1923, were 82,774 barrels valued at $230,698 of which was sent to Cuba 39,467 barrels; to the other West Indies, 5,019 barrels; South America, 17,573 barrels; Central America, 10,475 barrels; Mexico, 7,999 barrels; Canada, 1,508 barrels; and to other countries, 733 barrels.

The statistics of imports and exports of hydraulic cement in August, 1923, are not available.

Test Lime Process

Experiments conducted at the Bureau of Standards have shown a way to improve the manufacture of hydrated lime so that the grade known as "finishing" hydrate is regularly produced instead of the grade known as "masons" hydrate which because of its lesser plasticity commands a lower price. These tests have shown the plasticity depends not alone upon the colloidal content of the hydrate, but upon the effect on this colloid of the manufacturing process. The colloid, like glue, must not be allowed to dry out during the manufacturing process, and it must also be prevented from flocculating itself when the mixing water is added preparatory to use.

It has been found that the drying out can be prevented by letting the freshly made hydrate cool in an atmosphere of steam. Flocculating can be prevented by adding small amounts of a readily soluble calcium salt. A hydrator designed to apply these principles has just been completed for further experiment.



Dock Paved With Concrete

In order to furnish a safe harbor for the large fleet of motor fishing boats in San Francisco Bay, the State Harbor Commission has constructed a breakwater and a number of wharves. The floor of the wharves is paved with 4 inches of concrete and provided with heavy railing to facilitate the drying of the fishing nets.

The Economy of Winter Construction

We are all familiar with the statement of psychologists that men are the creatures of habit, but few of us undertake to apply that generalization to our own selves with a view to correcting habits that are uneconomic. For example, before present methods of construction existed, our forebears formed the habit of doing practically all their construction work during "good weather," that is in the late spring, summer and early autumn. This habit was at one time economic, for during the "bad weather" seasons the roads were practically impassable, and building materials could not be delivered. Moreover, in those days lime mortar was the only cementing material used for brick and stone masonry, and lime mortar can not be safely used in freezing weather for its hardening depends upon the chemical absorption of carbonic acid gas from the air, a process that does not occur when the lime is frozen. With the introduction of portland cement, however, it became possible safely to build stone and brick masonry as well as concrete in freezing weather, but the age-long habit of regarding winter-built masonry as being unsafe had too strong a grip to be easily overcome, and even yet causes many men to defer construction till "good weather" comes.

Architects, engineers and contractors usually know that most classes of building construction can be economically performed in the winter, but most "owners" of buildings are habituated to regard winter as an unfit construction time, and consequently defer ordering building construction until spring is at hand. But even members of the building profession have not entirely freed themselves from the ancient habit of looking upon winter as a poor time in which to build. They know that the average workman will not do as big a day's work in very cold weather as in warm weather, other things being equal, but they overlook the fact that other things are not equal. The very fact that winter jobs are not so plentiful as summer jobs makes for labor efficiency, since men will work harder when there is risk of being discharged and of not being able to secure another job quickly.

The prices of building materials are usually lower in winter than in summer because of the slackened demand, and this reduction alone frequently amounts to a considerable percentage of the total cost of a building. Usually more than half the total cost of a building is the cost of materials. Hence a 10 per cent saving on the cost of materials is equivalent to more than 5 per cent saving on the cost of the entire building.

One of the elements of building cost that is rarely seen in published statements of cost is the cost of delays in the delivery of materials. During the "good weather" seasons both the manufacturing plants and the transportation plants are apt to be overloaded. Hence even if the factory or mill is ready to fill your order the railway or the motor trucks are unable to deliver the material. In the slack season the cost of such delays is eliminated.

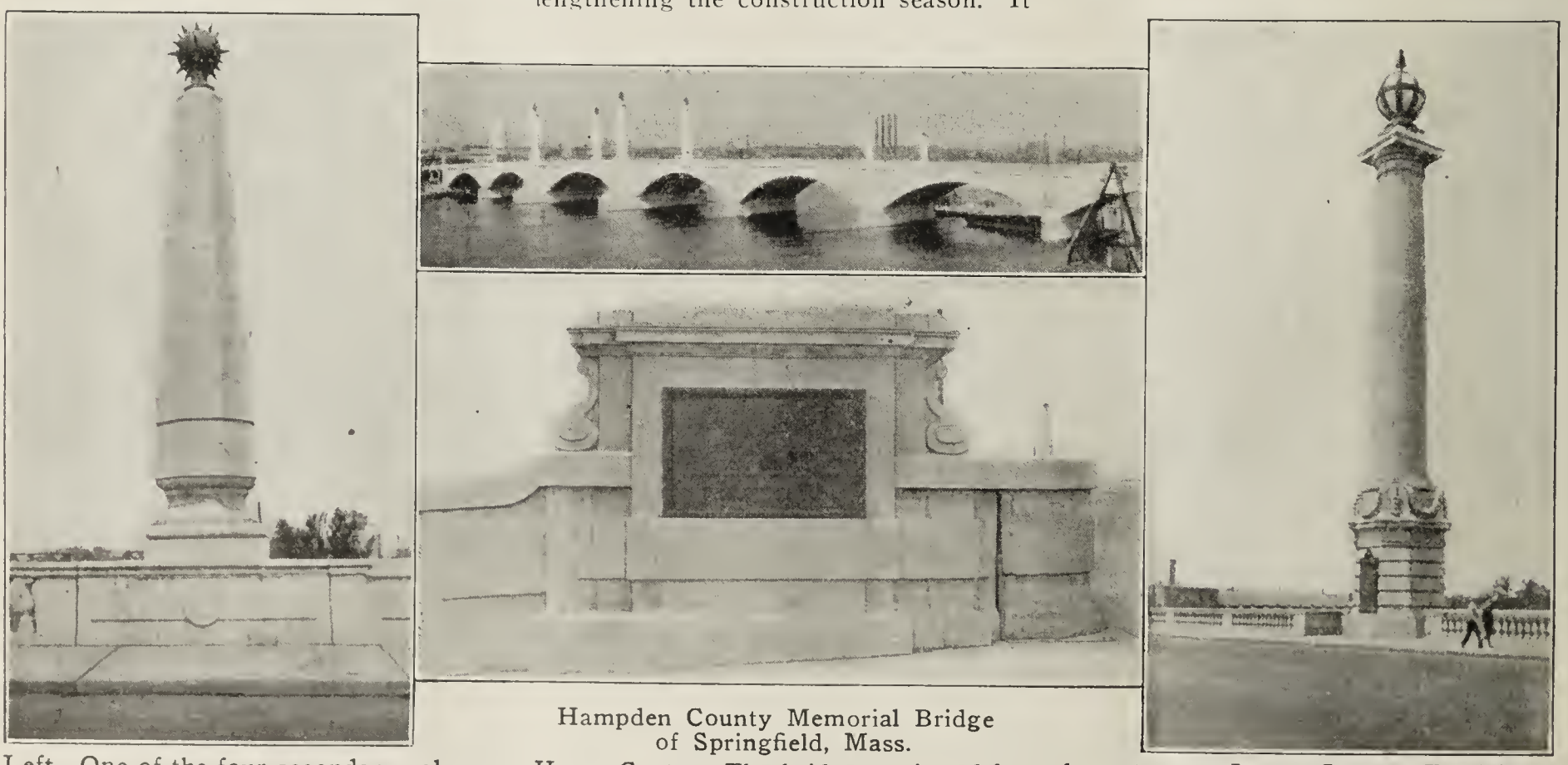
If a building is being erected for rental purposes, it is highly important that it be finished either in the early fall or by the first of May. If construction work is planned for the "good weather" season, delays in getting work started, delays in securing materials, and inability to secure an adequate force of workmen at all times, very frequently prevent the completion of the building until after the fall renting date, Sept. 1 or Oct. 1, in consequence of which the owner suffers a severe loss of income. But even where the owner expects to occupy his own building, failure to complete it at the expiration of his lease is sure to cause him both expense and inconvenience. The cost of failure to complete a building at the time when occupancy of it is planned, is an item that seldom appears in estimates of cost but frequently does appear in large figures in any complete summary of costs.

In recent years much has been written about the economic desirability of lengthening the construction season. It has been pointed out that if workmen and construction plant are idle one-third of the time (and it averages longer) then the labor cost of construction becomes 50 per cent more than it would be were it possible to keep them continuously employed. The income of both labor and capital, in the final analysis, must be reckoned by the year and if only 200 of the 300 available working days in a year are actually worked, the cost per diem, both for wages and for fixed charges on the construction plant, is greater by one-half than it would be were the full 300 days made productive.

This economic argument in favor of continuous building construction is unanswerable, provided a day's construction cost in the winter does not greatly exceed a day's construction cost in summer. We are sure that, with fairly good roads, with modern machinery and devices, with building materials that can be safely used in freezing weather, winter building can be almost, if not fully, as economically conducted as summer building; and that when consideration is given to all the elements of cost (such as labor efficiency, adequate labor supply, promptitude in delivery of materials, interest charges on the land and building up to the time of occupancy) then winter building construction becomes so clearly economic that even the most deep set habit of aversion to it can not survive.

It seems to us that every architect, every structural engineer, every building contractor, should submit estimates of building cost to his clients, demonstrating the real economy of all-the-year-round construction; for, after all, it is the "owner" who is responsible for most of the postponement of building "until the frost is out of the ground." The age-long habit of such postponement still grips the average layman.—*Engineering and Contracting.*

The National Concrete Products Association, composed of manufacturers of the Straub patented cinder concrete building block, was recently formed in Philadelphia. Mr. F. J. Straub was unanimously elected president.



Hampden County Memorial Bridge
of Springfield, Mass.

Left—One of the four secondary columns. Upper Center—The bridge as viewed from downstream. Lower Center—The Memorial Tablet. Right—One of the four main memorial columns.

Things That Make the Customer Buy From You
IV

By John Lee King

Have you ever visited the Chicago Stock Yards and watched a shipment of sheep follow a "bell-sheep" to slaughter?

Have you ever stood on a favorite thoroughfare, such as Fifth Avenue, New York, or Michigan Avenue, Chicago, and watched the women on parade, noticing that in many respects their mode of dress was as like as two peas?

Are you acquainted with that product of this twentieth century of ours, the flapper, that curious concoction of feminity and childhood that would consider it nothing less than a crime to be different from her sister flappers? Arctics in winter, furs in summer, bobbed hair all the time—that is the flapper. She is also equipped with a vocabulary largely made up of unintelligible slang. And her sisters are just like her.

Have you noticed that when there is to be a subscription to the Orphans of the War, the Japanese earthquake victims, or the Salvation Army, certain names are sought to head the list, and that, with these names at the top, the subscription is an assured success?

In other words, to cut a possible hundred questions of similar purport to one, have you noticed an outstanding characteristic of this Ultimate Consumer whom you want on your list of permanent customers—that characteristic which makes him follow the leader and hesitate to be different from his kind? If the big bugs of the town subscribe to the donation, he subscribes; if they do not, don't expect him to either. If the ladies of the town are wearing furs in summer, then expect your wife to want summer furs; if that isn't the thing this season, you're probably in a hundred or better.

They tell a story of a young physician with a new medicine case just a wee bit newer than his new mustache. He hung up his shingle in a small town and like Oliver Wendell Holmes, when he started practicing medicine, knew that he could say honestly "Small fevers thankfully received." But alas, days passed into weeks, and no small fevers came his way, although across the street the old, well-known doctor of the town was always busy.

This young doctor had plenty of time to think, and his studies about the make-up of the human body had trained his brain for the job of thinking. He finally decided how to proceed should a patient ever enter his office. Eventually one did come in, and the doctor, with no place in particular to go, grabbed his new satchel, his hat, and his future hope of business, and brushed past his first patient with the remark, "Sorry, madam, but I'll be back in an hour. I've just been called on an emergency case."

And he strode out of the office, out into the country, taking the air, and trusting to the tongue of a woman to advertise that he was a busy doctor. It was only a year later that he was in reality busy, for he had placed his faith in the right advertising medium, and the community, following that characteristic of the Ultimate Consumer that demands that success exist before patronage be given, came to him with fevers, small and large.

There is another story concerning a real estate man in Chicago. This story I can vouch for as true, although that fact does not contribute so much to it as an example of that same characteristic which plays such an important part in the buy habits of all of us.

This real estate man had a large force of men working for him. His pay roll ran into hundreds of dollars each week, when suddenly a panic hit the city, real estate slumped to zero, and there were no sales. Competitors began to lay off their men rather than to pay them their weekly minimum wage. Competitors began to look blue, and to carry faces as long as their businesses were short. They began to talk over among themselves what poor business conditions existed, and to feel sorry fo reach other and for themselves.

But this particular real estate man kept all of his men on the payroll and instructed them to keep busy traveling around the city just as though they were making sales, signing up business and closing contracts. While other real estate men were congregating on corners talking about hard times, he and his men were causing a commotion by the energy they expended in doing nothing but moving. If they met other real estaters, they merely exchanged words of greeting, admitted business was good with them, and kept moving.

That particular panic saw many real estate firms close up never to reopen, but this particular one found business coming its way as times got better. The ultimate outcome of refusing to admit that being licked developed this man into one of the largest operators in the city.

It has been said that "nothing succeeds like success." It can just as truly be said that nothing fails like failure. The reason that there are so many mediocre retail establishments is that their owners refuse either to succeed or fail, but plod along discontentedly with half-way success when, if they would but give heed to the make-up of the individuals around them, they could have businesses that would pay expenses to Atlantic City every summer.

The shiftlessness of some men accounts for the hagged appearances of some of the offices from which retail merchants attempt to sell cement and other building materials. You have seen these monstrosities just as I have: side-walk cracked and broken, building unpainted or tumbling down, a general air of failure written on the entire property. And when spring arrives frequently at offices like this you see the sign "Spring is the time to repair your home—buy cement now and tidy up the old place."

Now if the retail merchant who wants the business of Mr. Ultimate Consumer will only practice what he preaches; if his office, his trucks or wagons, his own attire, bespeak success and prosperity, a good step has been taken toward encouraging the would-be buyer to buy. Although the merchant who is not selling much may have judgment enough not to talk of hard times, his buildings are talking it all the time. Buildings never keep quiet, but rather tell the passersby that "here is a merchant that is doing well," or shout in no uncertain terms: "If you want to patronaze a failure, buy from my boss."

Building Activity

WASHINGTON, September 28. — Widespread activity in building construction and also in the construction of roads is commented upon by the U. S. Employment Service of the Department of Labor in its report on employment conditions for August.

"One of the features of this month's report is the continuation of the tremendous building programs in nearly all of the larger centers throughout the country," says the report. "In very few sections is any abatement noticeable, and vast numbers of building tradesmen and common labor are at work on projects of sufficient magnitude to insure permanent employment for some time to come.

"Activity continues with no signs of a let-up on the construction of state and county highways. Large numbers of both skilled and unskilled labor are employed on this work, and in some sections there is a demand for labor which is not being met.

"Generally speaking, industrial employment in this country today is on a satisfactory and sound basis, and the outlook for the future is one of the brightest in recent years."

Reflecting construction activtity the report shows increases in employment of 8.6 per cent in stone, clay, and glass products; 0.7 per cent in iron and steel and their products, and 0.68 per cent in railroad repair shops.

Regarding construction in New York City the report said: "There are no signs of any falling off in building activity. As a whole, operations are on a larger scale than ever before and work already under way is sufficient to maintain steady employment in the building trades for months to come. There still exists a shortage of bricklayers, plasterers, plumbers and plumbers' helpers, painters, carpenters, and tile setters. The large volume of municipal construction and street repair work has created urgent demands for unskilled labor, and more than 1,000 laborers are needed for this class of work."

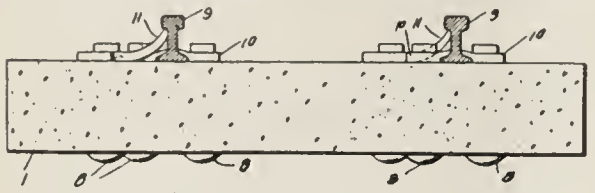
Relative to construction work in Chicago the report says: "The building trades are fully employed and there appears to be no slowing down in this industry, and the shortage of bricklayers continues to exist. Several mammoth projects are now under way employing all available labor."

The Sullivan Machinery Company, with main offices in Chicago, recently opened a new plant at Michigan City, Indiana, to supplant its former Chicago factory. It will produce air compressors, diamond core drills, drill steel sharpening machines, and cutter bit sharpeners. The plant is served by the Pere Marquette Railroad.

Interesting Cement Patents

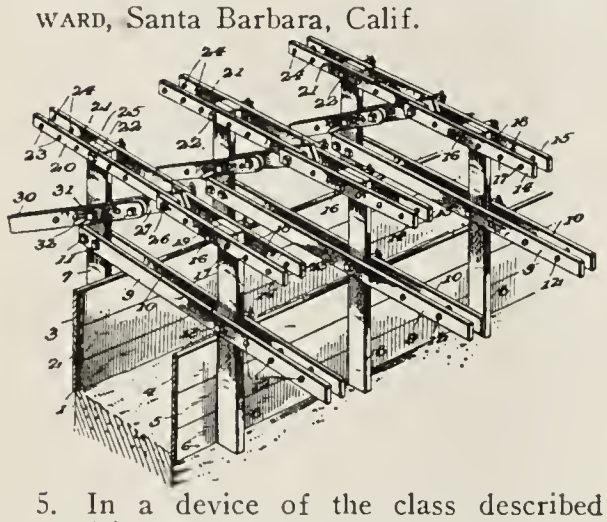
Recent Patents of interest to readers of Cement and Engineering News specially prepared for this publication by Clarence A. O'Brien, Registered Patent Attorney, Room 69, Southern Building, Washington, D. C.

1,466,003. REENFORCED-CONCRETE RAILROAD TIE. William C. Temple, Munsen, Fla.



A tie having a concrete body, a frame embedded therein having longitudinal plates, cross rods spanning and extending through and beyond the outer sides of the plates, cross rods having shoulders engaged by the inner sides of the plates, nuts threaded on said cross rods beyond the outer sides of the plates and terminating relatively close to the sides of the body and being completely embedded in the body, and positioning tubes for rail securing bolts disposed through the body at a right angle to said cross rods, and one of said tubes passing between and directly engaging certain of said cross rods.

1,466,830. FORM FOR CONCRETE CONSTRUCTION. Charles W. Hayward, Santa Barbara, Calif.

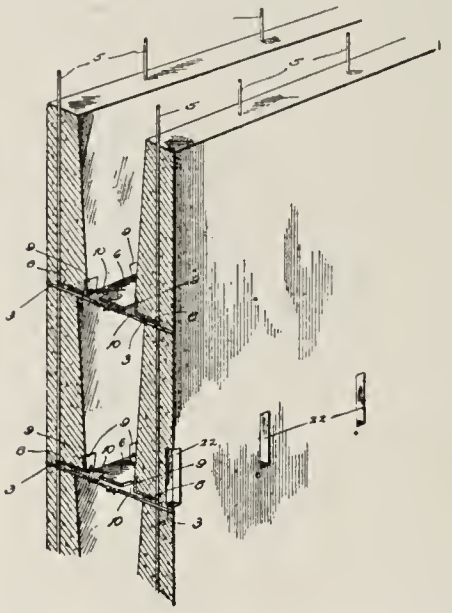


5. In a device of the class described comprising a leg, a movable leg spaced from the first leg, means connecting said legs intermediate their ends and providing a pivotal mounting for the movable leg, links pivotally connected to the upper end of the legs, a locking member having pivotal connections at one end with the free ends of the links, an operating lever pivotally mounted on the first mentioned leg with one of its free ends pivoted to the locking member intermediate its ends, the first mentioned leg being provided with a notch adapted to be engaged by the free end of the locking member for locking the legs in parallel relation, operation of the lever being adapted to lift the locking member out of engagement with the notch and swing the free end of the movable leg out of parallel relation with the first mentioned leg.

1,465,907. PROCESS OF PRODUCING CEMENT AND BY-PRODUCTS. Frederick W. Huber, Riverside, Calif., assignor, by mesne assignments, to Western Precipitation Company, a Corporation of California.

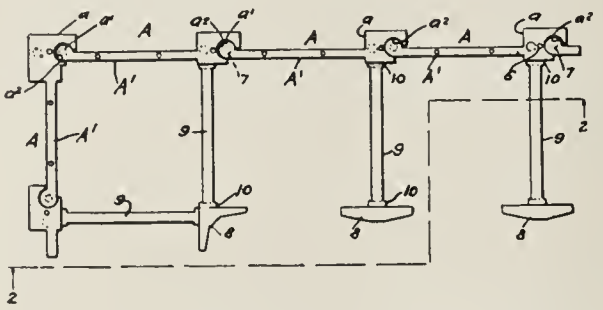
1. A process of making cement and by-products which comprises heating to a clinker-forming temperature, a cement mix containing potassiferous material and containing sodium chlorid in amount much more than equivalent to the amount of such potassiferous ingredients, thereafter washing the flue gases with an aqueous liquid capable of removing at least the major part of the potassium compounds therein.

1,467,241. HOLLOW CONCRETE WALL. George J. Engert, Spokane, Wash.



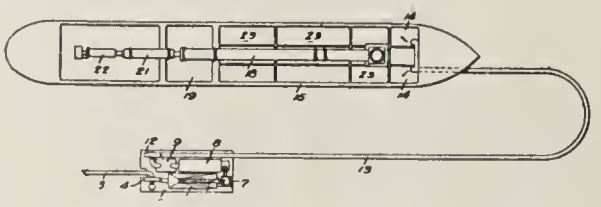
1. A hollow concrete wall having vertical reinforcing rods embedded therein between the sides of the wall and the hollow central portion thereof, and horizontally disposed plates embedded in the wall at intervals and bridging the central hollow space, said plates having openings therethrough and being connected with the vertical reinforcing rods.

1,467,470. CONCRETE BULKHEAD OR RETAINING WALL. Fredrik G. Borg, Chicago, Ill.



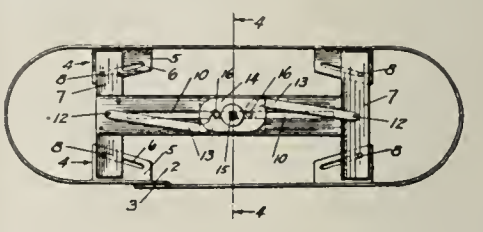
1. A buttressed dock or bulkhead made of concrete, consisting of a plurality of panels initially fabricated separately and each comprising a web, a bead formed at one edge of said web, the other edge of said web terminating in an enlarged columnar projection constituting a buttress and formed integral with the web, the said buttress being provided with a vertical groove at its outer edge adapted to receive the bead of another panel to thereby rigidly connect the panels, the buttress projections being adapted to sustain the total pressure to which the bulkhead will be subjected in use.

1,465,863. PROCESS OF AND APPARATUS FOR MANUFACTURING CEMENT. Louis E. W. Pioda, San Francisco, Calif.



7. The method of manufacturing cement from a submerged deposit of clay and shells in which the clay is in excess of the proportion necessary to produce cement, which comprises excavating and elevating the materials and water, removing a part of the clay, and in treating the elevated mass to produce cement.

1,467,760. COLLAPSIBLE CORE FOR CONCRETE CONSTRUCTION. Fred J. Homan, Santa Ana, Calif.

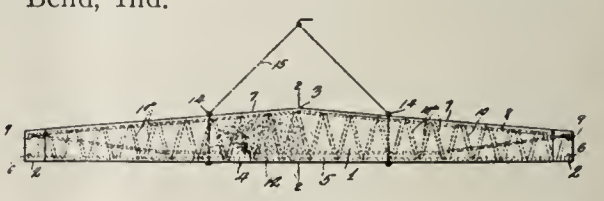


1. A collapsible core for concrete moulds, comprising a metal plate bent intermediate its ends to form a hollow, oblong chamber having its longitudinal sides substantially straight and having curved ends, the ends of said plate overlapping; a plurality of pairs of brackets, one member of each pair being secured to opposite sides of the chamber, each bracket having a side projecting inwardly at right angles from the inner surface of the chamber, each inwardly projecting side having a slot therein, said slot being nearer to the side of the chamber at its inner end than at the outer; a transverse bar connecting members of each pair of brackets; bolts extending through the ends of said bars and projecting through said slots; slotted bars secured at right angles to said first named bars; a rod projecting through the slots in said bars; links pivotally connected at one end to said transverse bars; and means for moving said links backwards and forwards so as to spread and collapse said core.

1,465,833. PROCESS OF MAKING CEMENT AND BY-PRODUCTS. Evald Anderson, Los Angeles, Calif., assignor, by mesne assignments, to Western Precipitation Company, a Corporation of California.

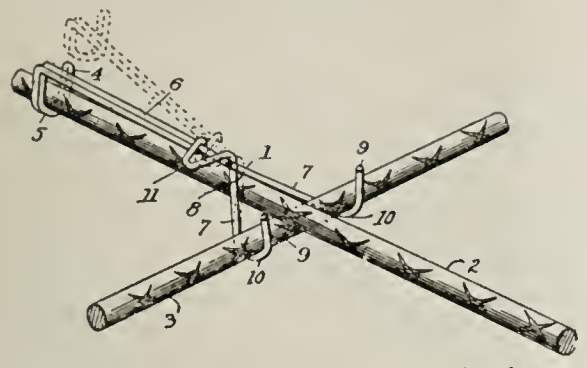
5. The process of manufacturing Portland cement and recovering combined potassium which comprises clinkering, by direct firing with powdered coal, a Portland cement mix containing potassiferous material and added sodium chlorid, and recovering combined potassium from the dust and gases leaving the kiln.

1,465,307. REENFORCED-CONCRETE BEAM. Richard C. Keogan, South Bend, Ind.



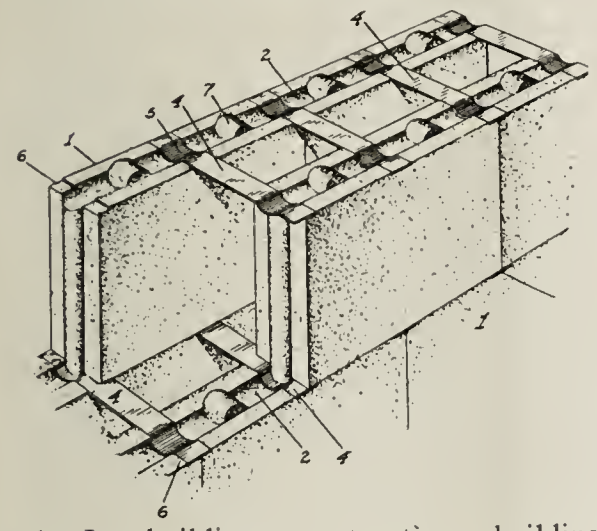
An elongated reenforced concrete beam adapted to be fabricated and hoisted to position, said beam comprising horizontally disposed spaced reinforcing bars, said bars being imbedded in a concrete body adjacent the bottom thereof, spaced reinforcing bars imbedded in the concrete body adjacent the upper side thereof and disposed in registering vertical planes with the first mentioned bars, said bars adjacent the upper side of the concrete body extending downwardly and outwardly from a central point, a member wound around all of said bars, said member comprising a plurality of straight portions, said straight portions connecting the bars together at angles other than right angles.

1,467,741. CONCRETE TIE CLIP. Earl D. Tubbs, New York, N. Y.



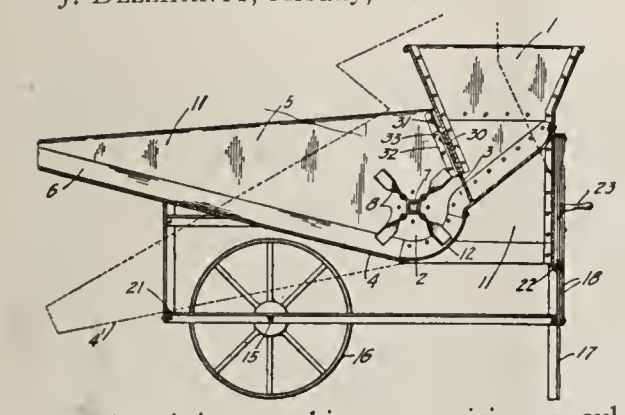
1. A clip of the character described comprising a shank, a hook on one end of said shank, and a pair of spaced hooks on the other end of the shank, there being a crotch between said spaced hooks to engage one of a pair of crossed rods which is also engaged by the hook on the remote end of the shank, while the other rod is engaged between said spaced hooks and the first rod.

1,465,421. TIE FOR REENFORCED CONCRETE CONSTRUCTION. Harry E. Clouser, Stockton, and Edgar R. Thornton, Los Angeles, Calif.



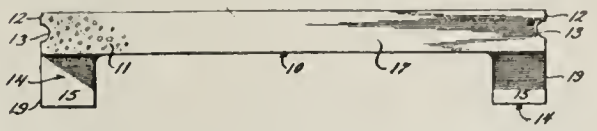
1. In building construction, building blocks therefor, a ridge along one edge of each block, and a groove to co-operate with said ridge along the abutting edge of an adjacent block, said ridge being shallower than the groove whereby when the blocks are placed one on the other a tie may be seated between said ridge and groove without causing the blocks to separate, and space is had for a binding material, the edges of the blocks on each side of the grooves being recessed at intervals to receive the ties and allow the same to lie flush with said edge.

1,467,237. MATERIAL MIXER. Edward J. Delehanty, Albany, N. Y.



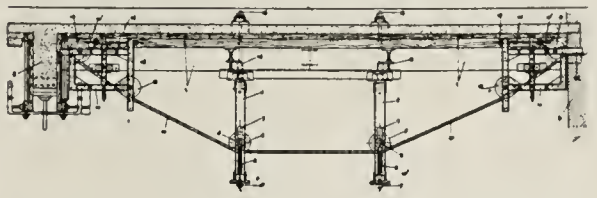
1. A mixing machine comprising a cylindrical mixing chamber, a hopper normally closed at the bottom but adapted to discharge into the side of said chamber, means for setting up or cutting off communication between said hopper and chamber, a trough tangential to said chamber along the bottom thereof, and a supporting means for the whole substantially coaxial with the cylindrical chamber; the hopper, trough and mixing chamber being rigidly connected and adapted to rock as a unit about the last mentioned means to discharge the contents of the chamber while retaining the contents of the hopper.

1,466,985. BUILDING BLOCK. William Briddes, Darby, Pa.



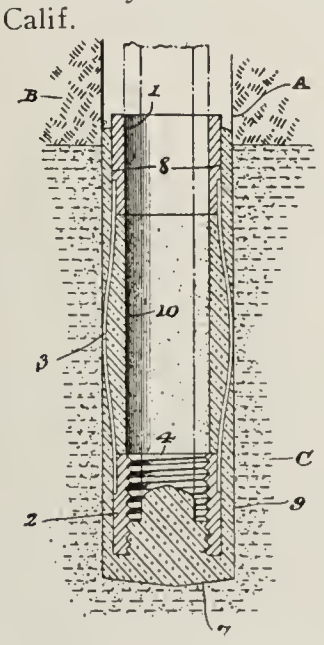
1. A building block comprising a flat body with top and bottom longer than its ends, each end having a groove throughout its length, and rectangular projection on the rear face of the block with their outer faces flush with the ends of the body and their top and bottom faces spaced from the top and bottom.

1,467,662. CONCRETE-MOLD SUSPENSION DEVICE. William van Aalst, Mortsel, near Antwerp, Belgium.



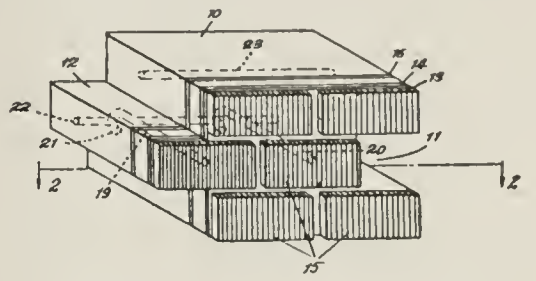
1. In a suspension device for supporting wooden and like framework for concrete beams, joists, ceilings and the like extending over a relatively large span, the combination of a pair of vertical steelwork supporting frames for the central portion of the span, having each a pair of rollers fitted at the base; a pair of substantially rectangular steelwork bracket frames attachable to the permanent end supports having each a pair of guide-sheaves and a pair of turn-back sheaves in diagonally opposed corners, the last-named sheaves being situated in the upper corner adjacent the corresponding permanent end-support; a pair of suspension cables, each extending between corresponding rollers of the supporting frames and from each of the latter to the corresponding bracket frame, passing under the guide sheave and round the turnback sheave towards the centre of the span; and combined adjustable means for securing the ends of each cable to the opposed bracket frames and applying a tension in a horizontal direction to said cable; substantially as described.

1,466,986. CENTERING AND CEMENTING DEVICE. John P. Burgher, Long Beach, Calif.



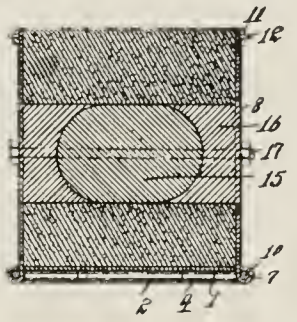
1. A cementing device for wells comprising hollow cylindrical end portions, and outwardly bowed spring metal strips connecting the same.

1,463,969. INTERLOCKING BUILDING BLOCK. Charles Pipitone, Brooklyn, N. Y., assignor, by direct and mesne assignments, to Interlocking Construction Corporation, a Corporation of New York. Serial No. 564,189. 9 Claims. (Cl. 72—36.)



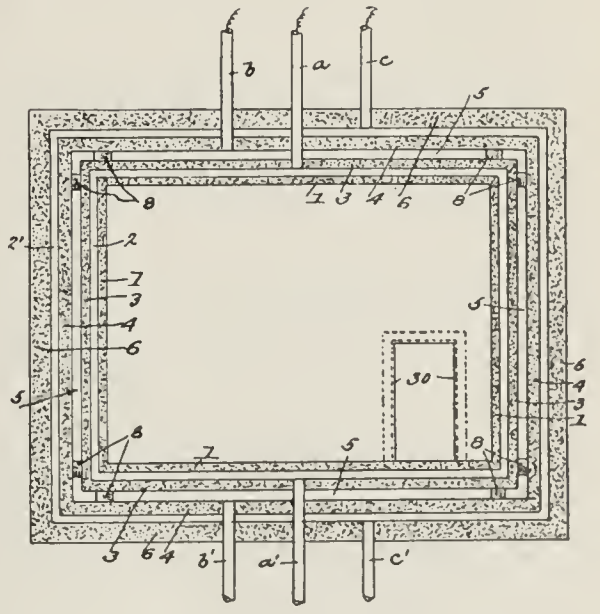
1. An interlocking building block, comprising a substantially rectangular body part of cementitious material having in one of its ends a transversely disposed groove and having on its other end in alinement with the groove a transverse extension member of smaller dimensions than the size of the groove, a plate of cementitious material on the front facing of the body part, having protruding spaced sections colored and relatively arranged so as to represent a number of structurally laid brick or stones, and an intersticed plate between the body part and said colored plate.

1,467,657. MOLD FOR CONCRETE BLOCKS. Harry D. Tamplin, West Manchester, Ohio.



1. In combination, a mold box, a main core forming member mounted in the box, a pair of auxiliary core forming members, and bolts passing through the core forming members so as to hold them in detachable engagement with each other in the manner and for the purpose specified.

1,467,676. CONCRETE STORAGE PLANT, REFRIGERATOR, AND THE LIKE. Simon Lake, Milford, Conn.



2. A concrete conservation structure having an outside double wall and an inside double wall rendered impervious to air and moisture and spaced apart, and interconnecting means for the outer and inner double walls arranged in the separating space and serving to maintain said space.

Substantial Profits in Concrete Burial Vaults

History seems to show that reverence for the dead and advanced civilization go hand in hand. Take the case of Egypt. The mummies of ancient Pharaohs still flaunt in the modern face the fact that the inhabitants of that age had conquered an art which the science of today cannot equal. The pyramids, monuments to the departed, stand as engineering feats which, in view of the equipment at hand to build them, have scarcely been surpassed in our own advanced age.

The Chinese have always been known as ancestor worshippers. They revered their dead and the deeds of the bygone, and step by step, built up a marvelous ancient civilization. Within the Great Wall nothing is cheaper than human life and nothing is dearer than the memories of those who have passed away.

All through history we find reverence of forefathers and great civilizations going hand in hand. Great empires have not been built by those who cast lifeless bodies to the natural vultures. Africa, the land where no burial provisions were formerly made, where life today was the only thing about which the inhabitants thought, was never molded with a great empire. The wild Asiatic tribes have never contributed substantially and permanently to the welfare of humanity. They have been unable successfully to dominate other peoples for any length of time. Their dead were gone and forgotten.

We have here a peculiar paradox to be sure, a set of facts which leads one to believe that the highest in life is attained by those who revere their dead. Curiously enough, many men whom we today recognize as having been great, were not appreicated by their contemporaries during life.

But out of all of this reverence for the deceased there has grown a tremendous industry, that of taking care of the remains. And as we go on, still clinging to the instincts which pervaded the makeup of our forefathers, we grope about for means of better taking care of the remains of our fellow men. Because of this research there is now growing, slowly but surely, a great and profitable industry, the making of concrete burial vaults.

The wooden boxes so commonly used as burial receptacles, are not considered satisfactory. They are, of course, not impervious to water, and cannot fight off decay. When they disintegrate, the weight of the covering earth breaks the boxes and they sink. Because of this fact, many attempts have recently been made to supplant the wooden receptacles with something more satisfactory and more permanent. Brick, slate, and even concrete blocks have not been satisfactory, for they are not impervious to water and cannot be easily moved. Steel, although serviceable for a few years, has the common weakness of all metals —it corrodes. The affinity of oxygen for iron, with the incident formation or rust, is so strong that no protective and permanent covering or paint has yet been discovered to separate the two elements.

Pennsylvania plant capable of turning out thirty vaults a week. Very little time was required to build up this business.

Concrete Superior

Then the concrete burial vault stepped into the field, claiming absolute permanence and imperviousness to water as its virtues. Concrete cannot rust, it does not corrode, say the makers, and it becomes stronger as time goes on. Then too, it is cheaper to make and to sell than its metal competitor. These points evidently stand the tests of experiment, for the concrete burial vault industry has made rather steady progress during its comparatively short existence. Demand has increased to such an extent as to make the installation of new factories all over the country profitable, but there is still lots of room for more plants, money makers which can be equipped at a surprisingly low cost.

Take for instance the plant of the Chicago and Hercules Cement Burial Vault Company, located in the city of Chicago and manufacturing both molds and vaults. About eight years ago Mr. John L. Janisch started his plant in a small way, using a building which did not have over three thousand square feet of floor space. In just a few years Mr. Janisch found that he had to have more room, so he built the beautiful and modern building shown in an accompanying photograph. On the lower floor vaults are made and stored, while on the second floor is located the shop for making molds. Although both molds and vaults are handled, the demand for vaults has increased so rapidly that the major portion of the business has now been directed at supplying sufficient receptacles for the use of surrounding customers. An idea of the rapid growth of the business may be gained from the figures for the past few years. In 1917 the Chicago company sold 892 vaults; in 1918, 1,043; in 1919, 1,180; in 1920, 1,361; in 1921, 1,354; in 1922, 1,073; while present sales indicate that the number for 1923 will be about 2,400. It can thus be seen that Mr. Janisch, a former cement contractor, has built up for himself a business which nets him substantial profits and which is moreover, growing bigger every year.

The question of selling the product seems not to be a big problem at all. Mr. Janisch has familiarized neighboring undertakers with his product and has created the demand from the ultimate consumer by running small ads in church folders and other small publi-

A prosperous young burial vault business built up by the owner within the past few years.

An automatic vault exhumed one year after setting. The casket was still in perfect shape.

cations. No salesmen go around to solicit business. All orders are taken over the telephone.

Profits Substantial

That the business is one in which the manufacturer of other concrete products may easily engage, is evidenced by the fact that the demand is greatest in fall and in spring, so that the plant may be worked to capacity during dull seasons, and the vaults stored for use during those seasons in which business is most brisk. The initial investment is, of course, very small, some men having built up prosperous enterprises after starting with about $200 in capital. As Mr. Janisch says, "It is not necessary to have a special factory building to go into the manufacture of cement burial vaults. Any shed or barn may readily be converted into an appropriate place for the purpose. With a set of molds, a small stock of Portland cement, torpedo sand, waterproofing material, reinforcing metal, and a one ton one-man chain hoist and tripod, you are equipped to manufacture and handle our vaults."

A specific instance in which a man with practically no capital developed a real money-maker is cited by the Automatic Sealing Vault Company, of Peru, Indiana. They say: "Three years ago Mr. Foreman (of Gas City, Ind.) was a workingman in a glass factory. Today he owns a vault business worth $10,000

New and modern plant of Chicago and Hercules Cement Burial Vault Company, an exceedingly profitable enterprise.

and is independent. This year his plant will easily net him $3,000 clear profit. When Mr. Foreman started his plant three years ago he was practically without means, his capital at that time being less than $200. He has done just what any man can do who is willing to hustle."

Another man using the same molds says, "Our business started small with 35 vaults the first year, but it soon increased and this year we have, to date, made 175 deliveries and expect to put out 300 to 350 vaults this year. At first we delivered with horses and wagon, but now we have two trucks. If our present increase keeps up we will need another. We began with one set of molds; now we keep four molds going. We had at first 1,000 square feet of floor space, but now we have 7,000 square feet."

In commenting on the situation, Mr. A. D. Meyer, of the Norwalk Mold Company, of Norwalk, Ohio, says, "The Norwalk Mold Company was organized in 1909 for the manufacture and sale of cement burial vault molds, using two types, the 'Reliable,' making a vault of low side construction, and the 'Permanent,' of high side. Our business has been satisfactory from the start, and has shown a nice increase each year.

"The use of these molds in the manufacture of the finished vaults has consistently shown a handsome profit to those engaged in the business. The demand for vaults has greatly increased in the past few years, as people have come to appreciate the worth and the desirability of their use as the only practical receptacle. In fact, very few burials nowadays are made without the protection of a cement burial vault and no small measure of this demand is due to the funeral director in arranging the interment.

"The cement vault is approved by all first class undertakers and an increasing number of cemetery associations are de-

Steel burial vault exhumed to prove corrosion. Note rusted places along sealing edge, especially on nearest side. Concrete vaults overcome this defect.

manding this modern burial. The vaults, being of cement, are impervious to water and strengthen with age and use. Other types of grave vaults are either subject to attacks of rust or other forms of disintegration, or are far too expensive to meet the requirements of the average person.

"We have many letters from our customers, all expressing their complete satisfaction with our product, and inquiries on hand at this time indicate a strong demand for our molds which, of course, we will try to satisfy. We expect a good fall and winter business and believe that the vault manufacturing industry, either by itself or in connection with other cement products, is a veritable bonanza to the worker in cement."

Field Is Promising

It can thus be seen that the manufacture of cement burial vaults promises to the concrete products man a good field for a prosperous business in an industry which is still in its infancy and is consequently not overcrowded. Opportunity seems to be at hand for the man who is willing to invest a few hundred dollars in a new enterprise in which others have found abundant profit.

As to the molds themselves, all have their good points. The man who is contemplating going into the business will find the investigation of the various kinds offered a comparatively simple task. He will find that with each kind men have made money. Each manufacturer can cite many cases in which businesses have started in a small way and have expanded with surprising speed. Some of the stories sound phenomenal, but their truth merely serves to indicate the wealth of opportunity existing in the field.

The molds themselves are of metal and are quite simple in construction, so that they may be easily removed from the vault after it has set sufficiently. The different types are largely similar in the use of reinforcements and the concrete mix, but differ somewhat in their methods of sealing. The effort here, of course, is to get a water-tight joint—but water-tight joints can be made in a variety of forms, so that each manufacturer can no doubt substantiate his claims of unperviousness to water.

The molds are usually filled with a mix of cement and torpedo sand. After the vaults have set, the molds are removed and the vaults are placed in storage. They are then usually coated with some waterproofing preparation.

Show window at Chicago and Hercules plant. The glass front of the vault reveals a wooden casket in dry and perfect condition, notwithstanding constant flow of water over top of vault.

After this they may be coated with white paint to make them look more attractive. This covering does not have to be watertight, of course, for the concrete itself has taken care of that part of it. Sometimes clients prefer something nicer. In that case, the vault may be given several coats of enamel, making a rather attractive looking article.

But the thing in a nutshell is this—concrete burial vaults are easy to make and they are easy to sell. Manufacturers of other concrete products can make them at such times as the demand for building materials and other products is not great, can store them, and then can find ready market for them later. Others who would like to enter business for themselves can find here a lucrative field which requires only a small investment. Manufacturers of cement burial vaults may be found here and there, but not everywhere. Because of the bulk and weight of the product, vaults can be shipped only a short distance, say a maximum of fifty or a hundred miles. Every center then, is a possible site for a prosperous business. There is lots of room for new entrants into the industry, and those who get into it now are early enough to be able to claim their share of the unusual profits. The field is truly a promising and a rich one.

Until recently the cofferdams which support the passenger bridges at the San Francisco Ferry Building were supported by wooden piles which constantly needed repairs. These wooden piles were recently replaced by concrete piles, the driving of which is shown in the accompanying photo.

Here and There In the Industry

Preliminary data and plans are being made for the construction of flood protection works for a portion of the city of San Antonio, Tex. Tentative estimates place the cost of flood protection at $5,500,000. In addition to this, it is proposed to spend approximately $2,000,000 additional for paving, sewers and parks. Flood prevention works consist of concrete retention dam, approximately 2,200 feet in length, to cost about $2,250,000; the widening and straightening of the channels of the San Antonio River and its tributaries, to cost approximately $1,750,000; reconstruction of bridges and other public improvements, made necessary by channel changes, to cost approximately $1,500,000. D. D. Harrigan, city engineer, has charge of all investigations and surveys.

The new 1,200 barrel cement plant at Lime, Ore., is rapidly nearing completion and will start production shortly. H. L. Knappenberger is manager of the concern.

The Empire Block Corporation, capitalized at $50,000, has entered the concrete products field in Utica, N. Y. L. W. Kunkel heads the firm.

According to General Manager Evans of the Buffalo Roller Sales Company, the company will be forced to double its factory force to supply the demand for Beaver concrete mixers.

The Green Bay Wiegand Concrete Products Company of Green Bay, Wis., has recently started production of concrete blocks and bricks. It is operating under a Shope license.

The Bland Engineering Company of Minneapolis, Minn., has been awarded the contract for extensive alterations and additions to the plant of the Diamond Portland Cement Company at Middle Branch, Ohio.

The Bateman Cement Company, of Bethany, Neb., has started production of a new type of stucco cement block for home construction.

The National Concrete Products Association, composed of manufacturers of the Straub patented cinder concrete building block, was recently formed in Philadelphia. Mr. F. J. Straub was unanimously elected president.

Stine & Ellis of Los Angeles, Cal., have recently opened a $100,000 plant to supply ready mixed cement. Business prospects are reported as being good.

The state of Michigan is continuing its investigation of the feasibility of state owned cement plants.

Portland cement mills operating in Indiana and Illinois are now supplying 90 per cent of the dealers in their market with their requirements. The situation has eased up considerably and there is but little long-haul cement coming in from plants outside the territory. Heavy rains, causing a temporary cessation in road building, have allowed the cement formerly used there to be diverted to building purposes.

Mr. F. W. Cook, Vice-President of San Antonio Portland Cement Company, died Monday afternoon, September 3, 1923, in the Presbyterian Hospital at Chicago after an illness of approximately two months following an operation.

Mr. Cook was born in Louisville, Kentucky. He attended the University of Indiana and later studied in the famous University of Heidelburg in Germany. After completing his studies in Germany he returned to the United States and entered the employ of his father in his father's bank at Evansville, Indiana, where he remained for six years. Mr. Cook came to San Antonio, Texas, in 1895 and shortly afterward associated himself with the San Antonio Drug Company. In 1908, Mr. Cook, in connection with Mr. C. Baumberger and Mr. A. Kronkosky, organized the present San Antonio Portland Cement Company which is the successor to the old Alamo Cement Company, organized in 1880, and has been the Vice-President of the first named company from the time of its organization until his death. He has been active in the affairs of the San Antonio Portland Cement Company continuously; also was a member of the Board of Regents of the University of Texas continuously since 1911 and at the time of his death was President of the Board. He was Chairman of the Board of Directors of San Antonio Drug Company and a Director of the Commercial National Bank of that city.

Practically everything is now in readiness so that the Signal Mountain Portland Cement Company, of Chattanooga, Tenn., will probably start operation soon.

The Beaver Portland Cement Company, of Gold Hill, Ore., has begun production at its new quarry at Marble Mountain thus assuring it sufficient raw materials to put the mill in operation again.

The Benedict Gravel Company, of Ionia, Mich., has capitalized for $150,000 and will start putting out gravel by the hydraulic process shortly.

W. B. Waldo and A. J. Stone head the new Bronx River Sand and Gravel Corporation of New York, which will operate sand and gravel properties. The company is capitalized at $125,000.

The Bound Brook Crushed Stone Company, of Bound Brook, N. J., is now making plans for the reconstruction of its $200,000 plant recently destroyed by fire.

The Dixie Sand Company, of Chattanooga, Tenn., has recently invested about $50,000 in new equipment for its plant.

About $35,000 will be spent in reconstructing the plant of the National Crushed Stone Company, at Sioux Falls, S. D., recently destroyed by fire.

The Rock, Gravel and Sand Company, of Niles, Cal., has opened a new plant at Eliot from which it will be able to increase its present output by about 150 cars a day.

The Peerless Sand Company, of Cheswick, Pa., was recently visited by a $90,000 fire.

The Security Cement & Lime Company, of Security, Md., has increased the capacity of its plant from 3,000 barrels to 5,000 barrels daily by recent additions to its plant.

Left—Officers of the Huron Portland Cement Company at the recent launching of the company ship, the "John W. Boardman." They are. left to right, John W. Boardman, Vice President of the company, after whom the boat was named; John B. Ford, President of the company; and S. T. Crapo, Secretary and Treasurer of the company. Center—The "good ship John W. Boardman" itself. Right—Miss Mary Crapo, daughter of S. T. Crapo, Secretary and Treasurer of the company, who christened the boat.

Cement and Engineering News

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Why the Annual Cry of "Cement Shortage"?

Every year in midsummer we hear that general construction work and road building projects are delayed or abandoned because it is impossible to secure cement. Yet every year during the summer there are large stocks of cement on hand in the manufacturers' storages. For example, the figures of the United States Geological Survey show stocks of cement and clinker in storage at cement mills during the summer of the present year as follows:

1923	Cement on Hand	Clinker on Hand	Total Cement and Clinker on Hand
July 31	8,801,000 bbls.	3,865,000 bbls.	12,666,000 bbls.
Aug. 31	6,080,000 bbls.	3,759,000 bbls.	9,839,000 bbls.
Sept. 30	5,492,000 bbls.	3,379,000 bbls.	8,871,000 bbls.

The three factors in the distribution of cement are the manufacturers, the railroads and the retail distributors. If the heavy midsummer demand is not supplied it is because the retail distributors and the large consumers have failed to store cement in anticipation of their needs. Their practice has been to expect a twelve months' output to be delivered by the manufacturers and the railroads in a four to five months' period, which is a task impossible of performance.

There is a general, but erroneous, theory that cement can be used only in warm weather. There is also the general idea of the building public that buildings must be begun in the spring and finished before winter. This creates a heavy demand for cement in the period from midsummer to late fall. At other times of the year, there is little demand for cement, but the cement mills are in full operation storing up cement to their capacities; or they are shut down because their storage bins are full, and the outgoing shipments are not large enough to permit of further manufacturing operations. The cost of shut-down idleness of millions of dollars worth of machinery adds greatly to the manufacturing cost of cement.

Cement consumption in the last ten years has grown from 80,865,527 barrels in 1912 to 116,897,194 barrels in 1922, an increase of forty-five per cent in this period. Manufacturers have kept pace with this demand by increasing their productive capacity, and have also made large increases to their facilities for storing coal, raw materials, clinker and finished cement. For example, one construction firm alone states that it has built cement storage houses for cement mills of a total capacity of 4,000,000 barrels in the past few years.

No figures are available showing total storage capacities of all mills. But an estimate of their storage facilities can be arrived at from the fact that on March 31, 1919, there was on hand at mills a combined stock of cement and clinker of 18,489,000 barrels, and on February 28, 1923, the United States Geological Survey reports a combined stock of cement and clinker of 18,088,000 barrels in storage at the mills. It is reasonable to suppose, therefore, that the manufacturers have provided storage facilities for from twenty to twenty-five million barrels.

The United States Geological Survey figures report the cement producing capacity for the year 1912 (109 plants) at 110,000,000 barrels and the capacity for the year 1922 (118 plants) at 146,500,000 barrels, or a capacity in excess of 12,000,000 barrels per month.

Shipments for the month of August, 1923, were 14,791,000 barrels, while for January shipments were only 5,419,000 barrels.

There can be no doubt, therefore, that the cement mills of the country in their capacity to manufacture, store, pack and load cement, are well abreast of the demand for their product.

The next link in the chain of distribution is the capacity of the railroads to provide equipment and motive power for the movement of cement. The report of the Car Service Division of the American Railway Association, of September 12, 1923, shows a loading of 1,092,567 cars for the week ended September 1, 1923. This is the highest week's loading on record and is seven per cent greater than at any time during the five previous years. It shows also, higher average tons per carload and a movement of greater average miles per car per day. The new equipment put in service for the first eight months of 1923 were 116,117 cars and 2,583 locomotives. The report shows also, a much less number of bad-order cars awaiting repairs than usual. On October 1st there were 54,159 locomotives in serviceable condition, an increase of 892 since September 15. Locomotives in need of repair were 9,823, or fifteen per cent of the total on the lines, the smallest on record.

A financial writer, in speaking of the railroad situation as late as October 6th of the present year, says: "The railroads are buying rails but railroad car buying is

A ready made cement storage house built for contractors and retailers by the Blaw Knox Company of Pittsburgh.

absent." Another writer states that this is for the reason that "the railroads are now back to normalcy as to equipment and physical condition," and are able to handle any tonnage that is likely to be offered.

While it is true that in many years during midsummer, railroad car supply has been inadequate for the prompt movement of all cement in storage at mills and needed for immediate use by consumers, yet the record of monthly shipments by the mills for a number of years shows that the railroads have done their part in keeping the public supplied with cement.

By thus following the cement supply through the hands of the manufacturers and the railroads, we are brought to examine the situation of the distribution of cement in its next stage, namely, into the hands of the retail dealers and to the large users who get their cement by direct shipment from the manufacturers. It is evident from what has been shown that the manufacturer and the railroads are functioning creditably in the distribution of cement. An examination of the storage situation of the dealer and large user shows that they neither provide sufficient storage facilities nor do they store even to the capacity of their present limited storage space. In spite of the great increase in the use of cement in the past ten years, the average dealer has not increased his storage capacity. He has, however, increased his capacity to distribute by the use of trucks in place of horse-drawn vehicles, and has from time to time added to his truck equipment. But the dealer and the large user still depend on the manufacturers to keep cement in storage for them at the mills, and expect to be able to have it packed and shipped out only a few days before they need it on the job. They depend, also, on the railroads to deliver promptly and in sufficient quantities in mid-season when the demand for cement and for transportation is at its height, and shipping facilities of manufacturers and railroads are already overtaxed.

This storage house is equipped with an unloader.

States and municipalities are large users of cement in the summer for road building and street paving. Some of them have learned that they cannot carry forward large paving and road building jobs steadily unless they accept shipments of cement early in the season, and store it consideraly ahead of their daily requirements. States that have provided storages for cement have been able to carry out their road programs without interruption and with greater economy than heretofore. States that refuse to store cement in advance of their needs are still crying out against a so-called "Cement Trust" and are threatening to build state-owned and state-operated cement plants.

A favorite type of cement store house.

The dealer and the large user have in most cases not kept step with the general progress of the cement industry.

Many builders substitute other materials for cement because they are under the impression that there is a "cement shortage" and that cement cannot be obtained. This results in loss of business to the dealers.

The cement manufacturers have spent vast sums of money to educate the public in the use of cement. They supply dealers with all sorts of assistance in the way of literature to promote the sale of cement. If the dealer will provide adequate storage for cement and will accept shipments from the manufacturers in advance of the demand of his trade so that he will keep his warehouse filled, or even half-filled, the public can be supplied steadily with a product which they are desirous of using. Storage facilities for cement are not difficult of construction nor expensive to build, and any cement manufacturer will supply dealers with plans and specifications for proper storage buildings. In other words, if the cement dealer will carry in stock the same proportion of his yearly requirements of cement as he now carries of his yearly requirements of other building materials such as lumber, brick, tile, etc., he will solve this so-called problem of "cement shortage." The dealer and the large user of cement can correct the erroneous impression on the part of the public that there is a "cement shortage"; and perhaps when this has been accomplished, the manufacturers will be relieved from repeated and groundless attacks by the states and Federal governments on the charge that there is a nation-wide "cement trust" that restricts production and fixes prices.

By providing storage for a proper supply of cement, the contractor on large concrete jobs need have no interruption to his work. By suitable cement storage, the cement dealer will increase his sales by being able to deliver promptly a product for which the cement manufacturers themselves, by expensive and consistent promotional work, have created a demand. This demand can be supplied if the dealer and the large consumer will co-operate in the distribution of cement as have the manufacturers and the railroads.

W. A. Pomeroy, who creates replicas of prehistoric beasts for a Los Angeles museum, has supplanted the orthodox marble by ordinary cement for his work. A block of cement is cast and then Pomeroy goes to work with his chisels and carves it out. In this picture he is completing a sabre-tooth tiger.

Cycles in American Business

What Is the Cycle?

Instead of taking advantage of so-called business "forecasts," some of us Americans are today going to the extreme of becoming the slaves of our prophets. The business cycle, a mystic reality to some men and an absurdity to others, continues to baffle modern business and in some cases to lead it astray. Prognosticators use the cycle in predicting general conditions and those who guard the purse strings are so enraptured that they artificially thwart the normal course of business to conform to the prophesies.

The business cycle is not a thing of mystery nor is it the incipient pet of theoretical economists. It is merely the name given to the trend of business over long periods of time, and is the natural outgrowth of our present industrial system. Aboriginal man did not have to contend with it. He supplied his own mates, and there were no periods of general prosperity or depression. He regulated his own demand and supply. The apprentice system too was able to function without causing general distress. A tailor made light suits in the summer time and overcoats during winter. The bootmaker took orders from his customers and filled them. Business tended to stay on the same general level always, so that periods of general poverty were rather infrequent.

But then the factory system came into being, and with it came a multiplicity of problems and the business cycle, a phenomenon which did not appear until the middle of the past century, and the first of which required some forty years for its completion. Cycles are the children of quantity production. A factory does not make only enough articles to supply existing orders, but instead produces an excess and then sends salesmen out to sell its product. Great quantities of manufactured articles are frequently stored until sold. Goods in the warehouse represent money which is not earning dividends, and idle money is not coincident with general prosperity. Consequently man actually works himself into dull periods, into periods in which he can make more than the market demands.

AN UNSYMPATHETIC RELATION
[Copyright: 1923: By The Chicago Tribune.]
SHE'S VERY LOW—AND STILL SINKING.
IT'S ABSOLUTELY DISGRACEFUL THE WAY HE TAKES IT!
I KNOW I'M SUPPOSED TO FEEL TERRIBLY UPSET ABOUT 'ER— BUT I JUST CAN'T.
MOTHER-IN-LAW STOCK MARKET
BUSINESS
BUSINESS OUTLOOK
ECONOMIC SPECIALIST
MARKET EXPERT
BUMPER CROPS
ORR

Orr in *The Chicago Tribune*

The Period of Prosperity

And here we have the real description of the cycle. Let us analyze more carefully what we mean by the term, "A period of prosperity." During that time prices are high because the demand is great; industrial activity is at its maximum; building operations are curtailed because factories are working too hard to bother with additional installations; exports are low and imports are high, because the demand for all kinds of goods seems insatiable; wages are high, and strikes are frequent, for labor knows that if it cannot work one place it can work another; industrial stocks are high, because they are earning high dividends; business failures are at a minimum; bank clearings are large and bank loans are large, with incident high interest rates. There we have in a nutshell what we call prosperity. Everything is moving, everybody is buying, and factories are pushing their facilities to the limit so as to be able to get the maximum share of high profits which accompany large demand and insufficient supply.

But in their eagerness to meet and beat down competition, factories push their capacities too hard, and soon find that the market has been satisfied despite the fact that large quantities of goods already manufactured have not yet been sold. The factory can continue its sales work indefinitely without producing anything additional, so it shuts down for awhile until the demand again catches up with the supply. But its labor, laid off, is not earning and consequently not spending money. It cannot buy the commodities of other factories, and those plants in turn find themselves in the same predicament as the first and have to curtail production, throwing great numbers of other men out of work. The process is similar to that of knocking down a row of blocks. The first topples, strikes against the next, knocking it down, and so on, until everything in sight is razed.

The Period of Liquidation

Now we enter upon a period of liquidation. Prices start falling, as manufacturers are willing to sacrifice their goods rather than to let them rot in warehouses; industrial activity in general is curtailed; exports are gaining and imports are falling; wages start on the downward trend; strikes become more numerous in combatting wage reductions; industrial stocks decline because bright dividends are no longer in sight; business failures naturally increase; bank clearings reduce and bank credit is contracted; loans are fast being called in; demands are insistently made for payments on account. These things are all natural consequences of the desire of producers to rid themselves of excess stocks. Business is beginning to look "rotten."

The Period of Depression

Then we enter upon a period of real depression, and in extreme cases, upon a panic era. The bottom has dropped out of the market, and all prices are low; industrial activity is at a minimum; building activity begins picking up, for the financially stronger factories are, during their idle periods, putting on additions to take care of future trade; exports are high, for there is very little local market; imports are at their lowest ebb; wages

too are low; strikes are rare, for men are only too glad to get work at any price to keep from starving; business failures are numerous; bank clearings are necessarily low and loans are still few despite the low interest rate. Slowly, however, the public begins using up its accumulated stocks, and a brighter future looms. Stock manipulators foresee coming prosperity, and sell their bonds so as to have more money for industrial stocks.

The Period of Recovery

Now we have our period of recovery. Slowly factories are again required to produce, and each in starting increases the wealth of its labor and the buying capacity of that labor, and thus contributes to the necessity for other plants starting. Prices begin going up again for demand is again being felt; industrial activity in general is on the incline; building operations are large, for everyone is rushing to secure ample facilities for taking care of coming business; exports are falling and imports are rising; wages are rising and strikes are rare; industrial stock prices are rising; business failures are declining and new businesses are being started; bank clearings and loans increase and interest rates start going up. From here we soon again enter the period of prosperity.

After every inflation, however, there must be a deflation, so after every period of prosperity there must be periods of liquidation, depression, and recovery. The recurrence of these different phases of business activity, in their unavoidable, inevitable, and unchangeable order constitutes the business cycle, a thing which will exist despite objections as long as our present industrial system lives. Man-made efficiency methods have inflicted upon society a regular series of ups and downs which it is humanly impossible to avert. True, the Federal Reserve System, if it functions properly, can make a better rounded curve of the cycle, but it can only mitigate it in its extremes and cannot possibly eradicate it.

Things have come to a deplorable state, however, when we allow the fear of the action of that cycle to obsess us in all of our daily routine actions, and that is just what is taking place today.

Men who have made studies of economic conditions and theories are selling to the public services which pretend to predict in advance the status of business. In a great many cases these prophesies are correct, but whether they are or not, they are also attended by a serious evil, an evil which is not only psychological but actual.

Cycle Worshippers

If one of the modern oracles says that a period of liquidation or depression is imminent, we immediately find that whether the statement be well grounded on fact or not, a great many producers start curtailing activity, laying off labor, and actually bringing about the condition which forecasters promised. They have, however, falsely brought ill-luck to themselves. They have forced a depression when it was not due, for their inactivity takes buying capacity away from a certain group of people and hampers others from selling their goods. In other words, if Babson, Brookmire, Dun, Bradstreet, Barron, and the rest of them should all happen to predict business inactivity simultaneously there would probably be business inactivity because their followers brought it on themselves, whereas if those forecasters had never spoken business might have naturally flourished.

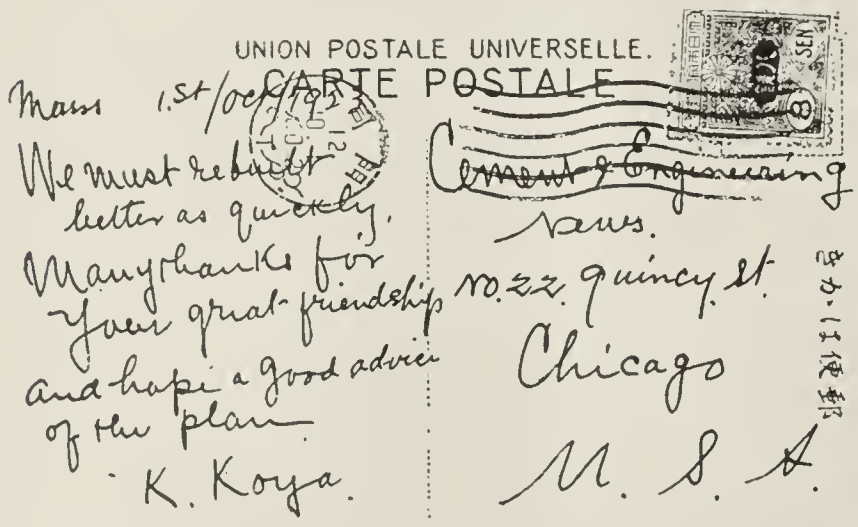
Forecasters, expert as they are, are subscribed to and supported by thinking business men because if their predictions were accurate business men would save much money during actual depressive times and would, so far as they were concerned, take the teeth out of the cycle. If, however, those same forecasters predict a false condition they aggravate the very thing they seek to alleviate, namely business losses.

Use Figures, Not Forecasts

Business statistics are fine things if they are taken as bases of decision and if business forecasts are not taken as final orders. Organizations have been built up which can reflect with remarkable rapidity the trend of business conditions in all sections of the country, and if the business man takes those figures for his own interpretation he will benefit by them. If, however, he takes the advice of those organizations as being final, he is inflicting upon society and upon himself an unjust condition by allowing business to slack when it should be good, and moreover, by allowing a handful of men to determine the entire financial history of this country. If any forecaster is taken as a final authority he probably has today more authority than our "Divine Right" autocrats ever dreamed of having.

If the United States is to be a democracy, let us make it a democracy of thought as well as of government. We can buy all the statistics we need, but by all means let us put our own interpretation on them. Let us assert our financial as well as our religious independence of thought.

This is the first of a series of articles dealing with modern business and its economic problems. The author is presenting his subjects in clear, intelligible style. It is his desire to present to the practical reader the condensed substance of discussions ordinarily treated in a way too technical and involved for the average man.—THE EDITOR.



A tragic reminder from one of our Japanese friends.

Eastern Cement Association Dissolved

WASHINGTON, Oct. 28.—Activities of the United State government against cement manufacturers for alleged violations of anti-trust laws have resulted in the granting of a decree by Federal Judge Knox in the United States District Court at New York dissolving the Cement Manufacturers' Protective Association. Proceedings against this association, which is composed of nineteen of the largest cement manufacturers of the country, were commenced in July, 1921, by United States District Attorney Hayward on the direction of the Department of Justice as one of the results of the Lockwood committee inquiry into building conditions in New York. Two actions were commenced against the association, one of a criminal nature involving all of the members of the association and forty-four individuals, and the other being an action in equity seeking the dissolution of the alleged illegal combine. A disagreement of the jury resulted over the trial of the criminal case. It was later agreed that testimony taken in the criminal trial should be taken as the evidence in the civil action. While arguments were heard in the case about a year ago the illness of Judge Knox caused a delay in the handing down of a decision until recently.

Judge Knox in his decree dissolving the Cement Manufacturers' Protective Association declared that although the manufacturers may have had no formal agreement to follow the practices of others "manufacturers do naturally follow their most intelligent competitors if they know what these competitors have been doing."

"I think that real competitive effort tended to become more and more feeble," said Judge Knox, "That manufacturers by reason of the exchange of statistics were equipped to regulate their production, and by common consent and a concert of action, do so to the end that the cement supply would at all times be a day or two behind the demand, and this created higher prices.

"In enabling this to be done the association, its officers and agents, together with its membership, materially limited the full and free operation of the contending forces of competition to which the public under the Sherman law is entitled, and unreasonably affected interstate trade and commerce. The government may have the decree asked for."

The Cement Manufacturers' Protective Association is an unincorporated organization having its office at 19 West 44th Street, New York City. Members of the association are the Atlas Portland Cement Company, Allentown Portland Cement Company, Alpha Portland Cement Company, Bath Portland Cement Company, Coplay Cement Manufacturing Company, Dexter Portland Cement Company, The Edison Portland Cement Company, Giant Portland Cement Company, The Glens Falls Portland Cement Company, Hercules Cement Corporation, Knickerbocker Portland Cement Company, Lawrence Cement Company, Lehigh Portland Cement Company, Nazareth Cement Company, Penn-Allen Cement Company, Pennsylvania Cement Company, The Phoenix Portland Cement Company, Security Cement and Lime Company, and The Vulcanite Portland Cement Company.

The Cement Manufacturers' Protective Association was formed at New York on January 6, 1916, and is one of a group of sectional associations of cement manufacturers in different parts of the country. This association was referred to in the proceedings as the Eastern Association.

The government charged that the activities of the association had resulted in the elimination of competition in violation of the Sherman anti-trust act, that prices of cement had been doubled and trebled, that defendant corporations have made enormous profits, that excessive salaries and bonuses have been paid by the defendant corporations, and that the high prices of cement have helped to retard building operations, thus depriving men of employment and preventing relief from a serious shortage of housing facilities.

According to the government the outstanding result of the alleged unlawful combination and conspiracy was a uniformity accomplished between defendant corporation in the following respects:

1. Uniform quality of product.
2. Uniform practice of making sales f. o. b. point of delivery.
3. Uniform freight basing points.
4. Uniform mill base prices, notwithstanding differences in cost of production by each.
5. Uniform freight rates, regardless of location of mills from which shipments are actually made.
6. Uniform prices to all dealers at the same points of delivery notwithstanding differences in cost of production and freight rates.
7. Uniform discounts allowed to dealers.
8. Uniform prices to contractors at the same point of delivery notwithstanding differences in cost of production and freight rates.
9. Uniform charges for bags.
10. Uniform credit allowances for bags returned.
11. Uniform differential allowed between prices quoted dealers and prices quoted contractors.
12. Uniform cost-accounting systems.

"Another result of said unlawful combination and conspiracy is the control and regulation of production," said the government in the original petition for dissolution of the association. "Having knowledge of each member's capacity to produce, the quantity actually produced, the quantity in stock, the quantity under contract, and in addition meeting frequently and discussing the probable demand for cement, it is a simple matter to produce only what it is believed the market will absorb without breaking prices, and plaintiff alleges that defendant corporations have materially restricted production.

"Another result is the unconscionable prices which have been charged for Portland cement since January 1, 1919, resulting in enormous profits to defendant corporations, as evidenced by large stock dividends and cash dividends declared and paid by certain defendant corporations from time to time; and generous increases in salaries and excessive bonuses paid to certain officials of certain of defendant corporations.

"Another and perhaps the most serious result is the effect the high prices demanded for cement have had upon building operations throughout the country. Due to the high prices of cement and other building materials, building operations have been greatly retarded—thus depriving men of employment and preventing relief from the grave shortage of housing facilities.

"Summarily stated, said unlawful combination and conspiracy has resulted in eliminating the competition to which the public is entitled, which the law contemplates, and which, but for said combination and conspiracy, would exist between defendant corporations in the manufacture and sale of Portland cement, and constitutes an unreasonable and unlawful restraining of interstate trade and commerce within the meaning of the Sherman anti-trust act."

The government's original petition in the case declared that the exchange of views at frequent meetings and the action taken pursuant thereto, the concerted adoption and observance of trade practices, the dissemination of statistical data together constitute a gigantic scheme of concerted action.

The defendant corporations according to the allegations agreed to furnish the manager of the association statements showing their several mill capacities for the production of Portland cement and instructed him to compile and distribute to all members statements showing their several mill capacities. They also agreed to furnish monthly reports showing the amount of clinker burned, the cement ground and cement shipped during the month, and the amounts of clinker in stock and cement in stock at the close of the month. The manager was further instructed to compile and distribute monthly to all members comparative tables and figures showing as to each defendant corporation the amounts of clinker burned, cement ground and cement shipped during the month, and the amounts of clinker in stock and cement in stock at the close of the month, a summary of that information for the elapsed period of the current year and for the corresponding period of the preceding year. Such tables, it was stated, have been regularly compiled and distributed.

Continuing the petition of the government said:

"Defendant corporations agreed to furnish the manager of said association full information as to the details of each contract (including date made, date of termination, name of contractor, full description and location of work, quantity sold, the price, quantity delivered to date, balance to be shipped, etc.) made for the future delivery of Portland cement and instructed him to compile and tabulate such information as to all the members and to furnish copies of such compilations and tabulations to each. Such information has been furnished and such compilations and tabulations have been and are being made and distributed daily, and a summary of the daily reports is distributed monthly. The checkers of said association, at the request of any member, investigate the construction work designated in any contract reported to ascertain the quantity actually needed and to determine the question of priority as between two or more such contracts made by different members covering the same construction work, and the facts ascertained are reported through the manager of said association to all the members interested therein.

"Defendant corporations also agreed to report to the manager of said association and instructed him to communicate to all other members all cancellations on account of contracts found to exceed the

actual requirements of specific construction work already undertaken or definitely projected, or found to be duplicates of contracts held by other members covering the same construction work. This has been and is being done. In consideration of the cancellations of contracts thus reported by certain members many other members made similar cancellations of their contracts, both upon their own initiative and upon the results of investigations requested by other members. This resulted in reducing to a minimum the quantities of cement under contracts for future delivery at prices specified as of the dates of the contracts and gave the manufacturers a more complete control of the situation.

"Defendant corporations agreed to report to the manager of said association semi-monthly the total shipments of cement made during the preceding 15-day period and instructed him to compile and tabulate such information as to all the members and to distribute copies of such compilations to each. This has been and is being done.

"Each defendant corporation having full and complete information as to each other defendant's production capacity, the quantity actually produced, the quantity sold on specific job contracts and at what prices, the quantity cancelled, and knowing that approximately one-third of the total production is sold on specific job contracts, and it being understood that the differential in prices between dealers and contractors would be 10 cents per barrel except in New Jersey where 25 cents per barrel is allowed, was cognizant of every important detail of the business of each potential competitor and had his finger constantly on the pulse of supply and demand. Consequently, when the supply showed a tendency to materially exceed the demand, the course to be pursued was thoroughly understood and defendants would shut down their mills or operate them at less than full capacity, thus effecting a substantial curtailment of production and nullifying the operation of the law of supply and demand.

"Against the concerted actions of the defendants, the dealers and the public have stood and now stand defenseless.

"A dealer located at, say Brockton, Mass., requesting quotations on a quantity of cement for stock, has substantially this experience: If he is a recognized dealer as defined in the Trade Practices, if the manufacturer thinks the dealer can make proper use of the quantity of cement specified, if the reports of the defendant Eastern Association show that the particular dealer is not indebted to any other cement manufacturer, although the indebtedness may be the result of a refusal to pay because of a legitimate controversy rather than a lack of ability to pay, the manufacturers will quote. Upon examination of the quotation the dealer finds that all companies quote the same price regardless of the location of their mills and the distance from Brockton, that all prices are f. o. b. Brockton, that all companies require him to pay the freight and permit him to deduct the amount thereof in making payment for the cement, that all companies allow him the same credit for bags returned in good condition, that all companies allow him the same discount if the bill is paid within 10 days, that all companies quote for immediate acceptance and for only one carload, which must be shipped within 15 days.

"If the dealer desires to purchase a larger quantity of cement he must show that it is to be used on a specific job and must furnish the manufacturer a copy of the contract for the construction of the building, whereupon the checkers determine whether the quantity ordered is actually needed, and if not, the excess is canceled. Dealers and contractors resent the activities of the checkers, but to no avail. If by any chance more cement has been delivered to a particular job than is required, and it is proposed to use it on another job in the immediate vicinity, the contractor is required to pay the difference between the original price and the prevailing price if there has been an advance in price in the meantime. The Brockton dealer finally holds an executory contract for the quantity of Portland cement the manufacturer is willing to let him have for the specific job. The price is, say, $3.72 per barrel f. o. b. Brockton, representing a Lehigh Valley mill base price of $2.30, 4 bags 60 cents, and freight 82 cents. Any manufacturer learning of this particular transaction through reports from the association or otherwise can instantly analyze the price and determine the mill base price charged by the manufacturer making the sale. If the established mill base price has not been charged, explanations are in order.

"The contractors are unable to purchase directly from manufacturers except at the same prices they would be required to pay to the dealer. The general public is also obliged to pay any prices the dealers may demand and at one time within the last two years, in certain cities in the northeastern section of the United States, dealers demanded of the public as high as $7 and $8 per barrel. The action of the manufacturers in adhering to their policy of selling only to dealers, under the conditions stated, was tantamount to sanctioning the extortion engaged in by the dealers."

Peninsular Company Wins Freight Fight

WASHINGTON, Oct. 28.—Reparation has been awarded the Peninsular Portland Cement Company in a decision by the Interstate Commerce Commission involving overcharges on shipments of clay in carloads from Bryan, Ohio, to Cement City, Mich., between June 25, 1918, and May 24, 1919, inclusive. The rate charged on similar shipments on and after May 25 1918, has been found applicable. The application of a minimum charge of $15 per car on cars of small capacity furnished in lieu of larger cars ordered was found unreasonable. Reparation was awarded on this account also.

The Peninsular Portland Cement Company, a corporation manufacturing cement at Cement City, Mich., by a complaint filed February 19, 1921, alleged that the rate of 40 cents increased to 56 cents on August 26, 1920, with a minimum charge of $15 per car, collected on numerous carloads of clay shipped from Bryan, O., to Cement City on and after June 25, 1918, was illegal, unreasonable, unjustly discriminatory, and unduly prejudicial.

The commission found that the applicable rates were 36.5 cents from June 25, 1918, to May 24, 1919, inclusive, 40 cents from May 25, 1919, to August 25, 1920, inclusive, and 56 cents thereafter with a minimum charge of $15 per car during each of the three periods; that on shipments made from June 25 1918, to May 24, 1919, inclusive, complainant was overcharged in the amount of the difference between the charges paid and those which would have accrued at the rate herein found applicable; that the application of the minimum charge of $15 per car on cars of marked capacity of 60,000 pounds or less, furnished at carrier's convenience and in lieu of larger cars ordered, was unreasonable, and that the charges on such cars should not have exceeded the product of the rate per ton contemporaneously in effect and a minimum weight equal to 110 per cent of marked capacity of the car furnished.

An Empire Red conveyor belt manufactured by the Empire Tire and Rubber Corporation, Trenton, N. J., for use in one of the big eastern cement mills. This belting is 640 ft. long, 24 inches wide, six plies, with ⅛ inch cover conveyor side and 1/32 inch cover on pulley side.

Making a Success of It in the Cement Industry

Career of the San Antonio Portland Cement Company a Fine Example of What Can Be Accomplished Despite Heavy Odds

By Charles Baumberger

President, the San Antonio Portland Cement Company

There was a time when the belief prevailed widely that Portland cement had to come from England where the outcropping of so-called Portland rock made the manufacture of cement a supposedly local industry. That erroneous understanding was a handicap to the early American cement producers; and it took some years to convince the public at large on this side of the Atlantic that Nature had also furnished us with abundant raw materials from which cement of the highest quality could be made.

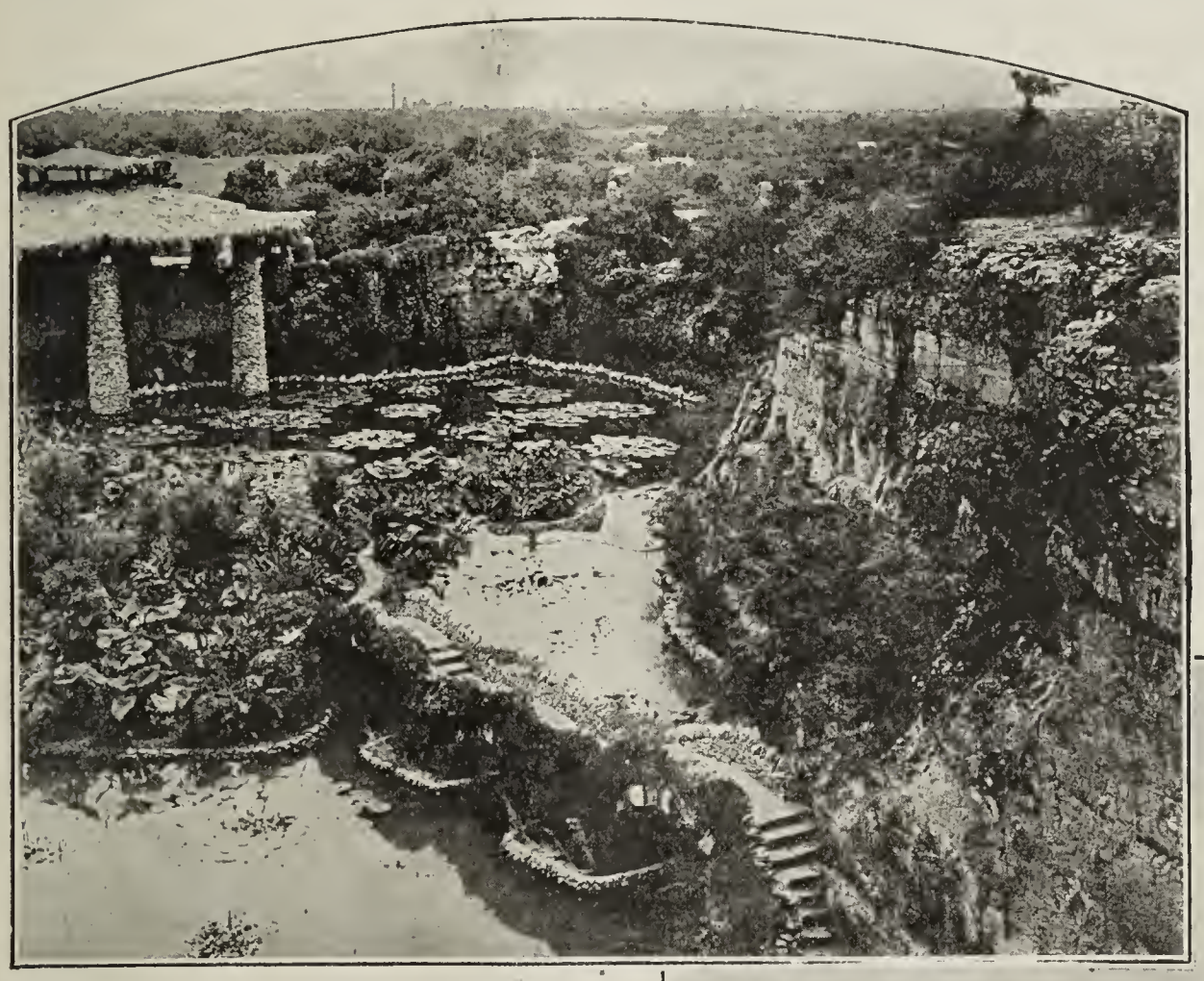
For those who may be unfamiliar with the subject, let it be said here that natural cement rock is nothing more or less than a limestone carrying a requisite amount of clay; and this rock, when properly treated, forms the basis of the cement which is used so extensively in building undertakings today. The following story brings to light how an accidental discovery—as has so often been the case—led to the creation of the first cement plant in the United States west of the Mississippi River.

In 1879, an Englishman of the name of William Loyd, while hunting within the northern corporate limits of the City of San Antonio, Tex., happened upon quarries belonging to the municipality and there discovered a blue argillaceous limestone which he thought he recognized as cement rock. Taking a piece of the rock back to town with him, Loyd sought advice lest he be mistaken in his conclusion. He turned his sample over to Mr. George H. Kalteyer, a graduate chemist. The latter, after making an analysis, pronounced the material natural cement rock containing about the correct proportions of lime and clay to make a true Portland cement.

Thus encouraged, Loyd interested W. R. Freeman, a hydraulic engineer; and together, in a small way, they made some experimental burns from that rock. Having but limited means, however, they turned to Mr. Kalteyer for both financial and technical assistance. Out of that association grew the idea of incorporating a company to manufacture hydraulic cements; and, accordingly, the Alamo Portland & Roman Cement Company was organized under the laws of Texas on January 15, 1880. The capital stock amounted to $3,100, divided into 124 shares having a par value of $25 each.

The original incorporators were William Loyd, George H. Kalteyer, B. J. Mauerman, F. V. Weise, and W. E. Jones. The author took care of the books of the company at that time for the modest remuneration of $10 a month. That sum to a lad of seventeen was not as small as it looks now. In 1884, opportunity gave me the opening I earnestly desired, and I was made manager of the plant. But don't let us anticipate our story.

As an outcome of the formation of the company, there was constructed an intermittent pot kiln; and the associate buildings were small and of lumber. The mechanical outfit consisted of a small Blake jaw crusher, a pair of rolls, and a vertical French burr mill. Power was supplied by an unpretentious slide-valve engine, the flywheel of which was composed of a cast-iron rim and wooden spokes. The plant was capable of grinding about ten barrels per diem; and, as there was no American standard to guide us, we tried to follow the European practice and ground to a fineness



A corner in the beautiful sunken gardens at San Antonio, Tex., on the site of the quarry which furnished the rock for the first cement manufactured west of the Mississippi River.

All that is left of the original Schoefer Kiln of the Alamo Cement Company, now a picturesque feature of Brackenridge Park.

*By courtesy *Compressed Air Magazine.*

of 5 per cent residue on a No. 50 cloth. It might be well to state here that all the cement was bolted and that the rejection from the bolt went back to the burr mill.

The mill building had three floors: a ground floor, where we had wooden bins and where the cement was stored after it was seasoned; and two floors above where the seasoning was done by spreading the cement in layers varying in thickness from six to nine inches. The cement, while seasoning, was aerated by turning it over with shovels

Another view of the sunken gardens in Brackenridge Park, San Antonio, showing the old kiln of the Alamo Cement Company in the middle distance.

once a week and by testing it from time to time until it satisfied the soundness test. This test was made much in the same way as it is carried out now, but in those days we were ignorant of the boiling test and depended entirely upon the cold-water test to determine soundness. No wonder, we occasionally shipped "green cement." The plant was located close to the quarries but fully three miles distant from the nearest railroad. This was a handicap, because all fuel had to be hauled to the mill and the finished product similarly transported to the city.

The outlook as many of our acquaintances saw it was not a promising one, and we had our full share of Job's comforters. The county poorhouse was then located adjacent to the mill, and we were often jokingly reminded, "Well you're right next to the poorhouse, and there should be consolation in the thought that you won't have to go far when the venture fails."

The burning of the cement rock was done by making alternate layers of fuel and rock—the fuel being coke. It took about a week to burn a kiln, and the result was something like 120 barrels of cement. The output of the kiln, after burning and cooling, was hand-picked; and that portion which clinkered was classed as Portland cement while the remainder was used for making natural or so-called Roman cement.

The quarry overburden was limestone containing from 10 to 15 per cent of clayey matter. Upon burning, this material produced a hydraulic lime; and the stuff helped to pay for removing the overburden in order to get at the cement rock. In fact, the company found it necessary to engage in the lime business and in the sale of building stone so that it might eke out a precarious existence. However, the tide turned favorably before the end of the second year, and we had reason to believe that we had not undertaken to carry through a forlorn hope.

Before 1881 came to a close, the business had grown sufficiently to warrant erecting another kiln, and on the 1st of December of that year the capital stock was increased to $10,000—each share being valued at $25. The charter was then amended to read "Alamo Cement Company." The sales of our product had assumed what seemed to us enormous proportions, that is, 1,000 barrels a year; and our commercial enthusiasm was such that we deemed ourselves the foremost producers in the world. Texas was not then as interested as she is now in what outsiders were doing—her industrial horizon was a comparatively limited one.

Forty-two years ago we charged $18 a short ton for Roman cement and $22.50 a ton for Portland cement, in bulk. The gross weight of a barrel of Roman cement was 300 pounds, and the similar weight of a barrel of Portland cement was 400 pounds. We charged $3.25 for the Roman cement and $5 for the Portland cement, in cooperage. No attempt was made to put up the cement in sacks of uniform weight for shipment, and a bag might weigh anywhere from 150 to 250 pounds.

Our main business was in lime and building stone, and we burned cement only occasionally: the same kilns being used for burning both the cement and the lime. Owing to the fact that we were not able to induce contractors to use our cement in laying sidewalks—indeed, experienced difficulty in marketing our product, we were forced, in self defense, to go into the sidewalk business so as to find an outlet for our surplus. As an aid in promoting this departure we obtained the right to use in the State of Texas what was known as the "Schillinger patent." The Schillinger patent covered the process of subdividing concrete sidewalks and floors into blocks for the purpose of controlling expansion and contraction. The right cost us

A sidewalk laid in San Antonio in 1883 with "Alamo" cement. The fine quality of the material is evidenced by the present appearance of the walk.

$1,000; but the money was well spent, because we were able to collect a royalty on all sidewalks constructed in that manner in the state. To those who used our cement the royalty was at the rate of two cents per square foot, while the charge was five cents per square foot when foreign cement was employed.

The sidewalk business was not a source of unmixed satisfaction. As already mentioned, the cold-water test was our only means of determining soundness, and every now and then we utilized unintentionally unsound cement. As a result, a sidewalk, after being down several days, would occasionally bulge

and swell by reason of the expansive force of free lime. Our particular concern was to deal with this situation before it attracted general attention; and more than once in the dead of night we tore up the work and replaced it as quickly and silently as possible. Our practice was to cover the walks with planks for protection, and to water the concrete twice a day—making observations at the same time by lifting the boards. This procedure gave us a chance to note what was going on without exposing our work to public gaze.

Back in the "eighties," General Q. A. Gillmore, then a lieutenant-colonel of engineers in the United States Army, was a recognized authority because of his well-known book, Hydraulic Limes and Cements. Inspired by the desire to win wider confidence in our product, we prevailed upon the mayor of the City of San Antonio and the municipal engineer to take at random from our stock samples of Portland cement and Roman cement; to put them under seal; and to send them to General Gillmore to be tested for both tensile and compressive strength. This was in May of 1881; and the report by that officer was highly commendatory. Thereafter, business grew steadily better.

By 1889, the demand for cement had increased sufficiently to justify the company in making further improvements. We built an upright shaft kiln of the Schoefer type, and ground the raw material first on French burrs or millstones, adding water, and then passed it through a pug mill. This mud was next made into bricks and the bricks were put on pallets and conveyed outside for air drying. After drying, the bricks were fed into the kiln for burning. This procedure proved economical in fuel consumption, for we were able to burn Portland cement clinker with 15 per cent of bituminous coal and to produce an average of 50 barrels daily. The method was continued until 1897, when still other improvements were given consideration. At that date, the rotary kiln had been adopted by the leading plants located in the Lehigh Valley of Pennsylvania; but we had no oil in Texas at that time, and none was discovered until four years later. Our problem was, therefore, to find a way to use the rotary kiln but with some other fuel.

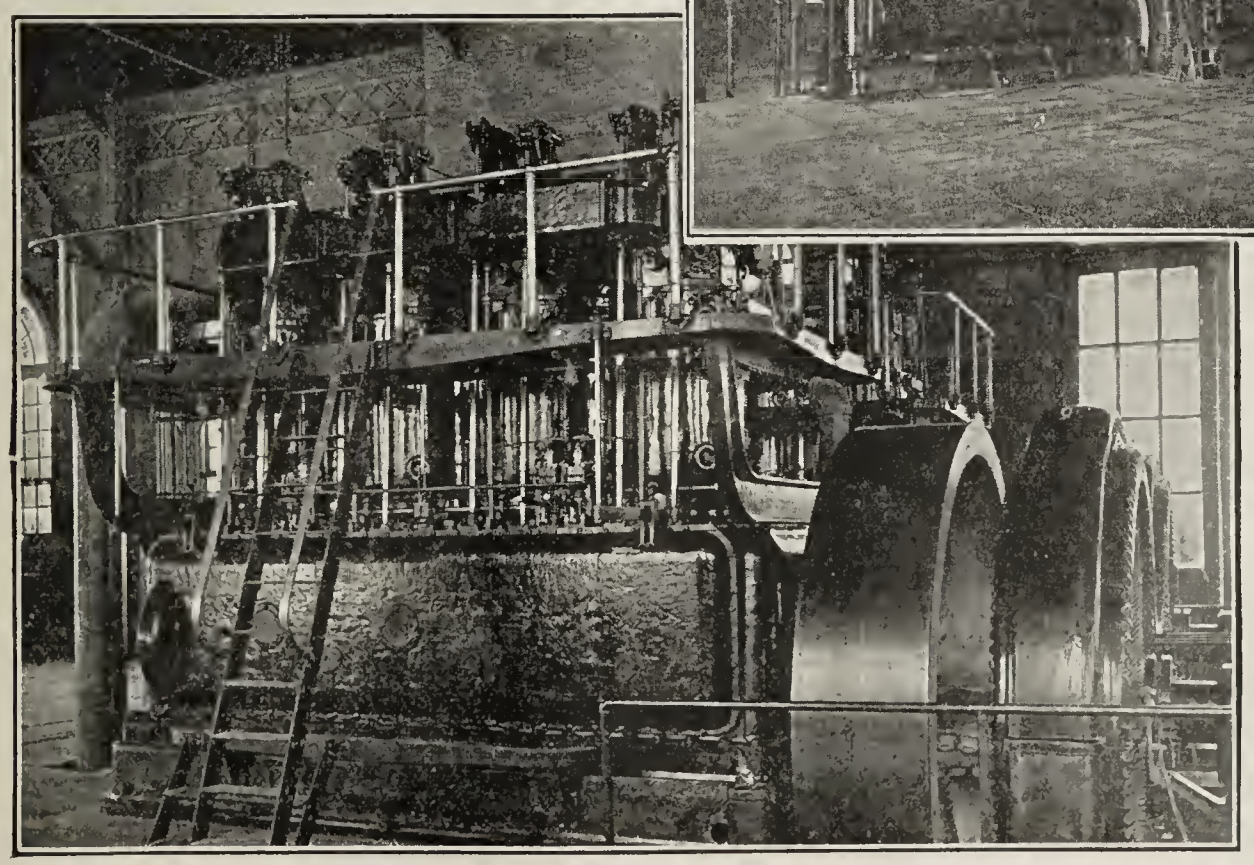
From a German publication we learned that powdered coal was being successfully fired under boilers, and it occurred to us that possibly the DeCamp system might also be utilized in rotary kilns. Mr. Kalteyer went to Europe and while there purchased one of the DeCamp apparatus as well as a mill for grinding coal. Unfortunately, he died in August of 1897, shortly after his return to the United States, and the task of carrying out the plans fell to the writer. We bought a 50-foot rotary kiln from W. F. Moser & Son of Allentown, Pa.; and we were able to burn Portland cement with powdered coal until 1901 when, upon the discovery of petroleum in Texas, we adopted fuel oil.

The demand for our cement had so increased by 1908 that the old mill was no longer able to satisfy the market; and for various reasons we decided to abandon the original site and to relocate on a larger scale where we would be in close touch with the railway. As part of the scheme of expansion, the company changed its name and was incorporated as the San Antonio Portland Cement Company. As previously mentioned the writer entered the service of the original company in October of 1880. Ten years later he became secretary, in addition to exercising the office of manager, and in 1897, upon the death of Mr. Kalteyer, he was made president.

Notwithstanding the fact that petroleum was to be had in Texas in 1911, when the company was brought face to face with the need of considerably amplifying its power plant, still this fuel was by no means as cheap as Texas lignite which could be delivered at the works for $1.50 a ton. The utilization of either bituminous or anthracite coal was out of the question because of the high prices of those fuels. Therefore, the problem was to find a satisfactory way to use the native lignite.

"In many places this effort to reduce taxes a lignite-coal gas producer which, in connection with the producer gas engine, offered an economical solution of the prime-mover problem. Accordingly, the San Antonio Portland Cement Company decided to install an equipment of that nature. That outfit was composed of a 4-cylinder, 21½x24-inch Rathbun vertical gas engine developing 500 H. P. at 200 R. P. M., and of Smith gas producers. Mr. H. O. Rinehold was in charge of the erection of this plant, and after completing that work he continued on as operating engineer. In 1912, the cement company purchased additional gas producers and another engine of the type and size just described. These engines were directly connected to 3-phase, 60-cycle, 480-volt Crocker-Wheeler generators. As a result of the excellent performance of the gas engines, a third unit of the same make was purchased in 1913. That machine had 8 cylinders of 21½-inch bore and 24-inch stroke; and at 200 R. P. M. it developed 1,000 H. P. The engine was directly connected to a General Electric generator. Mr. Rinehold became chief engineer and operated the power plant until 1920, when he was made plant manager of the entire mill.

Engineering progress and other factors brought to a focus in 1922 the question of still another change in the power equipment; and a careful study of the situation revealed that the wisest step would be to substitute oil for producer gas as a motor fuel. It was therefore decided to remodel the gas engines so that they could be operated as oil engines by the Price direct-injection system.



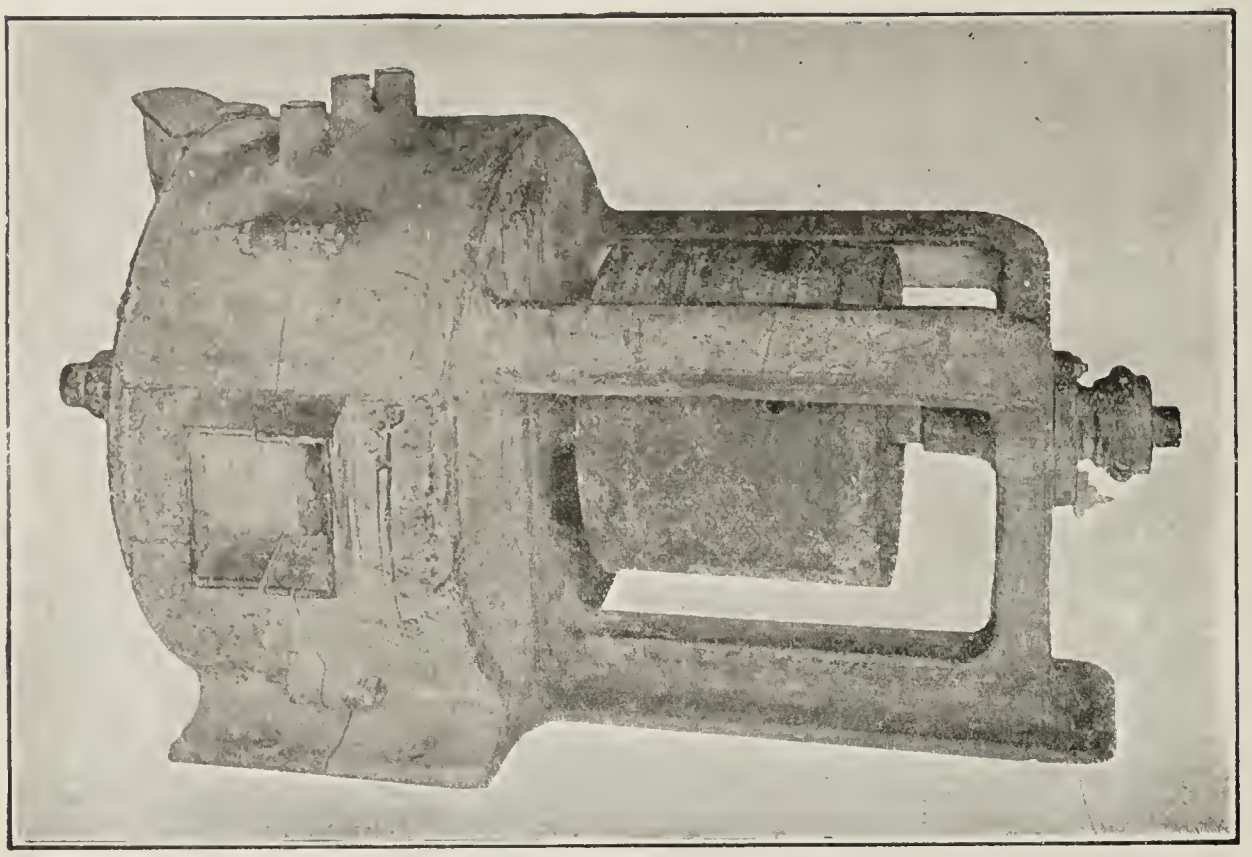
Close-up of one of the two 480-H. P. Price-Rathbun oil engines at the plant of the San Antonio Portland Cement Company.

A general view of the power plant of the San Antonio Portland Cement Company showing the direct-connected, 1,000-B. H. P. Price-Rathbun oil engine at the left and the two 480-B. H. P. units of the same make at the right.

The reasons for changing the engines were: the cost of lignite, which had advanced from $1.50 to $3.25 a ton; the increased price of labor required to run the producers; the badly worn condition of the producers; and the fact that the engines, themselves, because of hard and continuous service, were in need of extensive overhauling. A further contributing factor was that the company had

arranged for the use of fuel oil throughout the mill. There is ample warrant for the belief that the remodeled engines are $100 a day more economical than they were when working on producer gas.

The oil employed is from the Laredo field in Texas, and is known as "Mirando" crude. It contains 19,200 B. T. U.'s per pound; has a specific gravity of 22 Beaumé; and weighs approximately 7.68 pounds per gallon. Taking the total number of kilowatt-hours generated in 1922, and the total amount of fuel oil purchased at $1.60 per 42-gallon barrel, the fuel consumption was .54 pound per kilowatt-hour. The overall efficiency of the generators, including excitation losses and windage, should be figured at 92 per cent. This would mean .3714 pound of this particular fuel per brake horsepower. It is authoritatively stated that approximately 18 kilowatt-hours of current are required per barrel of cement when manufactured in a modern mill where all the equipment is electrically driven. The cost of providing current with the gas-producer plant was on the basis of .7 cent per kilowatt-hour as compared with .4 cent per kilowatt-hour with the oil-engine plant. A consumption of three pounds of lignite per brake horsepower-hour, including stand-by losses, was formerly needful. The lubricating oil used during the year 1922 amounted to the equivalent of one gallon per 4,000 rated horse-power-hours.



The original mill used for grinding cement at the plant of the Alamo Cement Company.

In conclusion, it might be said that the present capacity of the San Antonio Portland Cement Company is 1,500 barrels per diem; and that improvements are in hand that will shortly make it possible for the mill to turn out 2,400 barrels daily. Looking back to our start in 1880, it is plain that we have traveled far along the industrial highway; and it is our intention to keep pushing forward by utilizing every mechanical development, every engineering advance that will make for economy of operation and increased output.

Building Codes and Concrete Block

We all know that the public must be educated to the use of a new product, but only those who are successful have really applied that principle to business. Many commodities could be more popular if people were educated to their use. Take for instance, the case of concrete block. At the present time approximately six thousand plants produce in the United States each year, nearly 500,000,000 block. The consumption is however, by no means uniform throughout the country.

Detroit for example, has a per capita sale of about fifteen block per year while Chicago, a more active building market has a per capita sale of less than one half block. Detroit, Cleveland, Pittsburgh, New York, Milwaukee, Philadelphia, Peoria, Toledo, Los Angeles, Omaha, and many other cities have learned that concrete block is an economical construction material while such towns as Chicago, San Francisco, St. Louis and Kansas City are still using a great preponderance of common brick.

Two conditions probably account for the unpopularity of concrete building block where they are not used to any great extent. In the first place the manufacturer has not learned to produce a suitable product and in the second place, certain building codes prohibit or restrict the use. The situation at Chicago is typical. Here the building code allows the use of concrete block only in residences and apartments not over two stories high but even in construction projects coming within the ruling, other types of block exclude concrete in the majority of cases. Recently there has been agitation on the part of some people to change the building code, which admittedly is not now as favorable to concrete block as we should like for it to be.

But even that change would not remedy the situation entirely, for the concrete products men themselves are at fault. Even if code would be thrown wide open to concrete block tomorrow there would be but little material change in the quantity sold for its appearance is not attractive, its quality is not always the highest and its merchandising methods are rather poor. Chicago builders do not believe in concrete block and block men have not put forth any concerted effort to educate them or the public to the merit of their material. Neither have the Chicago block men adapted standards of quality or standard tests.

In Cleveland, Pittsburgh, Detroit and New York the public is kept informed as to the relative high quality of concrete block and therefore when it builds that material is specified. In Chicago people are certain of results only when they use other construction materials. Concrete block are unknown quantities from the standpoint of quality or performance.

Revising building codes will not turn the trick. The adoption and enforcement of standards of quality and the cooperative effort of all block men in a regular educational advertising campaign will make Chicago one of the greatest concrete block towns in the country. Without the foregoing effort, Chicago will remain a brick town regardless of the provisions of the code. Should anyone doubt that concrete block houses can be built in Chicago under the Chicago code, providing the block are the ordinary one piece type and provided that the plans do not call for more than two stories. CEMENT AND ENGINEERING NEWS will undertake to have the plans approved.

Chicago is given as an example in this article but there are other cities where some folks are laying the blame for small sales to the building codes, where the true solution is to be found in the quality of their product and especially in their merchandising methods. Cooperative educational campaigns are the most effective weapons the products men have.

Test Hollow Tile

WASHINGTON, Oct. 28.—Tests showing how much load hollow tile walls can carry are described in Technologic Paper No. 238 issued by the Bureau of Standards. The document contains the results of thirty-two tests on walls of hollow tile. These walls were four feet long by twelve feet high and were six, eight and twelve inches thick, representing the outer wall of a house. Among other results, these tested showed that a wall with the hollow spaces or cells of tile set vertically is nearly twice as strong as one in which the cells are placed horizontally.

"Wasteful use of building materials, with consequent increase of construction costs and rents, is often due to lack of knowledge of how much load these materials can safely bear," says a statement by the bureau. "This situation prompts architects, contractors, and the framers of building codes to call for an amount of material they know will be safe, without knowing whether or not it is excessive.

"Avoidance of such waste can be brought about by furnishing the building industry with reliable data as to the strength of the different materials used and of the different types of construction, so that each piece of material entering into the construction of the building can carry all the load it is safe for it to carry, and no more."

The Japanese Cement Situation

WASHINGTON, Oct. 28.—Cable advices received through governmental channels indicate that such Japanese cement plants as were in the path of the earthquake were not damaged sufficiently to curtail in a serious manner the production of cement in that country.

Latest information is to the effect that at the time of the earthquake Japanese cement plants were producing at a rate of about 14,000,000 barrels annually and that the earthquake reduced this capacity by about eight per cent. This would mean that the annual production was reduced from 14,000,000 barrels to something like 12,880,000 barrels. The cable containing this information adds, however, that plans for repairs and additions to existing cement plants contemplate an increase in their total capacity to 17,000,000 barrels. This figure represents a marked increase over a period of the last few years inasmuch as in 1921 cement produced in Japan totaled only 7,686,000 barrels.

There have been no developments as yet indicating that the Japanese will need to obtain American cement in any considerable quantities, if at all. Such information as is available is that for the present at least the domestic output will be sufficient to supply the Japanese demands. F. R. Eldridge, chief of the Far Eastern Division of the Bureau of Foreign and Domestic Commerce, touches on the cement situation in a trade information bulletin issued by the department.

"There is every possibility that some of the larger factories and office buildings will be constructed of concrete and steel, as this type of construction has proved earthquake proof and will probably carry a much lower insurance rate in the future than other type of construction," says Mr. Eldridge. "In this connection it is interesting to note that Japan imports practically no cement, but during 1922 exported 1,738,028 piculs (1 picul equals 133 1/3 pounds), and for the first six months of 1923, 514,354 piculs. About 25 per cent of this export was taken by the Philippine Islands, 25 per cent by China, 25 per cent by Kwantung Province (South Manchuria), 15 per cent by the Dutch East Indies and five per cent by British India. Japan's production of cement in 1921 was 7,686,136 barrels. This was the output of thirty factories, one company alone, the Asano Cement Co. (Ltd.), being credited with about six-sevenths of the production. One of this company's principal factories was in Kawasaki, and it was reported that this factory was damaged by the earthquake. Whether the productive capacity of the other factories will be stimulated so as to continue to make Japan self-sufficient in cement is an interesting problem, but it is pretty well demonstrated by these figures that Japan has not only manufactured cement enough for its domestic requirements in the past but has actually had a surplus for export ranging from fifteen to thirty per cent of the production."

No Cement Inquiries Yet

The fact that the Japanese government has made no inquiries through the American government with respect to cement is construed as meaning that the Japanese do not anticipate difficulty in supplying their own needs. Inquiries relative to other construction materials have been received through the Department of Commerce. Secretary of Commerce Hoover has made it known that the Japanese government had asked for information particularly as to the possibilities of purchasing considerable quantities of lumber and steel at fair prices. As a result of these inquiries, Secretary Hoover communicated with trade associations representing manufacturers of these commodities and was informed that the American manufacturers stood ready to supply whatever is needed.

More definite information as to the needs of Japan for structural materials is expected to be available after the session of the Japanese Diet on November 10 when a reconstruction program will be decided upon. There is a controversy over whether a long term program involving the extension of permanent construction over a period of twenty-five years should be adopted, or whether a short term program providing for completing the work in five to seven years should be adopted. A long term program probably would mean the use of more concrete construction in the permanent buildings than would be the case if a short term program were adopted. If it were planned to complete the work within a comparatively short period the Japanese probably would rely to a greater extent upon permanent wooden buildings than upon concrete. On the other hand, the adoption of a short term program might mean a more immediate demand for such cement as is needed than if the construction were extended over a longer period. If the short term program is adopted it will be necessary for Japan to obtain extensive loans from other countries and a considerable quantity of construction materials will undoubtedly be purchased abroad.

No Purchasing Syndicate

A cable to the Department of Commerce from Commercial Attache Julean Arnold at Tokyo states that there will be no attempt to form a syndicate of a small number of firms for the purchase of reconstruction materials for the present. The proposal to form a combination of five leading Japanese firms, including Mitsui & Company, Okura & Company, Suzuki & Company, Takata & Company, and Mitzibuishi & Company, who handle all of the reconstruction purchasing, has been temporarily abandoned, according to authoritative information received by the commercial attache. This will leave the enormous purchasing requirements of Japanese individuals open to free competition, according to the Far Eastern Division of the Department of Commerce, and should be an extremely valuable development as far as the representatives of American firms located in Japan are concerned.

The Metropolitan Reconstruction Board which will direct the rebuilding program in the devastated area of Japan has been named by the Prime Minister, according to a cablegram received from Commercial Attache Arnold. The Board is under the direct supervision of the Prime Minister and is made up of a president, two vice presidents, and a personnel of about 600. Six bureaus are to be organized, two of which, the Land Adjustment Bureau and the Material Supply Department, will be headed by the vice presidents. The four remaining bureaus, City Planning, Construction, Civil Engineering and Finance, are to be headed by other members of the Board.

Viscount Shantei Goto, Minister of Home Affairs, was named as president. S. Miyao, former governor of Hokkaido, was named vice president and will serve as chief of the Land Adjustment Bureau. K. Matsuki, former director of the Tokyo Electrical Department, also was named vice president and will head the Material Supply Department. The City Planning Bureau will be directed by H. Ikeda, former deputy mayor of Tokyo. K. Sano will serve as chief of construction, R. Naoko as chief of the Civil Engineering Bureau, and S. Sogo as head of the Finance Bureau, complete the Board.

To Plan Reconstruction

The purposes of the Board are the preparation and execution of city plans for Tokyo and Yokohama, the application and enforcement of the building code, the care of other matters pertaining to reconstruction and the extension of the emergency supply ordinance. In accordance with the imperial ordinance under which the Board was organized all plans for financing must be approved by the government.

Reconstruction plans are described in a report to the Department of Commerce from Commercial Attache James F. Abbott, Tokyo.

"It is estimated in Toyko that the rebuilding of the devastated area of Japan will be extended over a period of from five to seven years and that the full employment of labor during that period will cause great prosperity throughout the Empire," says Mr. Abbott. "This prosperity will not only be reflected in the foreign purchases of building and construction materials for the rehabilitation of the stricken cities, but will increase the purchasing power of the masses at large and cause the imports of all necessities and so-called luxuries to show increases. Plans and specifications for the rebuilding of the affected area are being drawn up at present by the Capital Restoration Board and it is expected that they will be completed in time to be submitted to the Diet when it convenes on November 10. Meantime no permanent construction is permitted and temporary buildings are springing up like mushrooms throughout the stricken area.

"The shipbuilders and electrical industries were seriously damaged by the earthquake and the demand for electrical equipment is heavy at present. It is stated that the government will probably make direct purchases of lumber and steel products in the United States. Steel-framed reinforced-concrete buildings are generally conceded to be best suited for business buildings in Japan and a heavy demand for structural steel and other building materials is anticipated. Demand for machinery to replace that destroyed in factories is heavy and the demand for sawmill equipment is especially active. Many inquiries are being received regarding portable houses and heavy purchases of motor cars and trucks are reported.

Finance Plans Doubtful

"It is not certain just yet how the financing for the rebuilding will be .handled Some favor a rapid rebuilding program financed with money secured by floating foreign loans, while others advocate building more slowly with funds raised mainly by internal loans, hoping thereby to prevent further inflation and encourage thrift. A happy medium will be struck, no doubt, by resorting partially to both plans.

"Following the lifting of the moratorium financial conditions have been generally satisfactory, although the question of fire insurance is still unsettled. The fire insurance companies contend that, without government aid, they will be unable to pay more than four per cent of the losses covered by policies amounting to a billion dollars. With government assistance the In-

(Continued on page 50)

The Use of Hydrated Lime in Concrete

By R. P. Brown*

Each year brings further information about the value of hydrated lime in concrete. Fifteen years ago it took a bold engineer or contractor to add hydrated lime to concrete. Today practically every engineer, architect or contractor has had some experience with it. Formerly its use was practically limited to structures designed to retain or exclude water such as reservoirs, dams, sewers, etc. Today the functions of hydrated lime in concrete are better known and its use is extending rapidly in all sections of the country and in all classes of construction.

There are three main functions of hydrated lime in concrete which are now quite well recognized. They overlap, but and one point may be sufficient to warrant the addition or specification of lime. Perhaps the best known function is that of "water-tightening." Next might be "lubrication" or "workability." The third may be thought of as that property, which has no specific name, of preventing segregation. Each and all of these advantages may be secured without sacrifice. In fact, the use of hydrated lime is advocated to "make good construction better." It is not, however, a panacea for all the ills that concrete may be heir to, nor can it be said to make poor work good.

Watertightness

Let us now consider the first of the three main functions of hydrated lime in concrete, namely, its ability to render concrete watertight. This is achieved first because of the extreme fineness of the hydrated lime particles. We naturally thing of portland cement as being an extremely fine powder when 78 per cent is required to pass through a 200 mesh sieve (40,000 meshes per square inch). That is fine, but hydrated lime is still finer. The A. S. T. M. specifications for hydrated lime call for 85 per cent passing a 200 mesh sieve, and hundreds of laboratory tests indicate that ordinarily from 90 to 95 per cent will pass this or the 250 mesh screen. In fact, most of the hydrate passing a 200 mesh screen will be found in the last tube of an air analyser. If it were possible to make such a screen, about half the lime passing a 200 mesh screen would go through one of 1,000 meshes per inch, or 1,000,000 meshes per square inch! This extreme fineness is not secured by grinding as in the case of cement, but by the chemical action of hydration, which operates on molecules, which are about the most minute structures recognized by science.

This extremely fine powder works into and fills the voids that normally exist in concrete, reducing them so greatly that water cannot pass through. In producing this impermeable mass the lubricating value of the lime also plays an important part as it assists in working the aggregate together and reducing large voids.

While hydrated lime may be considered as being chemically inert in the presence of cement, it is ultra fine and this assists mechanically in plugging up such minute pores or capillaries as might occur. Some moisture may enter the concrete, but it will cause the colloidal or superfine portion of the cement and the hydrated lime to swell and very quickly prevent passage of water through the mass.

The question of whether hydrated lime is efficient as a watertightening agent has been studied in a number of laboratories and tested on countless jobs in the field, with the result that it is acknowledged both efficient and economical. The most recent series of tests was conducted by some senior and graduate students at the University of Wisconsin under the supervision of Professor M. O. Withey and the results show conclusively that hydrated lime made the concrete watertight under pressures as high as 40 pounds per square inch.

Workability

Workability means a lot on the job. A harsh mixture is difficult to place economically. The dry mixes produce strong concrete in the laboratory, but they cannot be placed easily in the field and sometimes are impossible to use. Even though the mix can be placed, it requires so much tamping and working to produce smooth surfaces that its use is not economical.

Only too frequently a harsh concrete is handled by dosing it with water and washing it into place. That means poor concrete every time and sometimes even this large excess of water will not solve the problem, as for instance where very heavy aggregates are used.

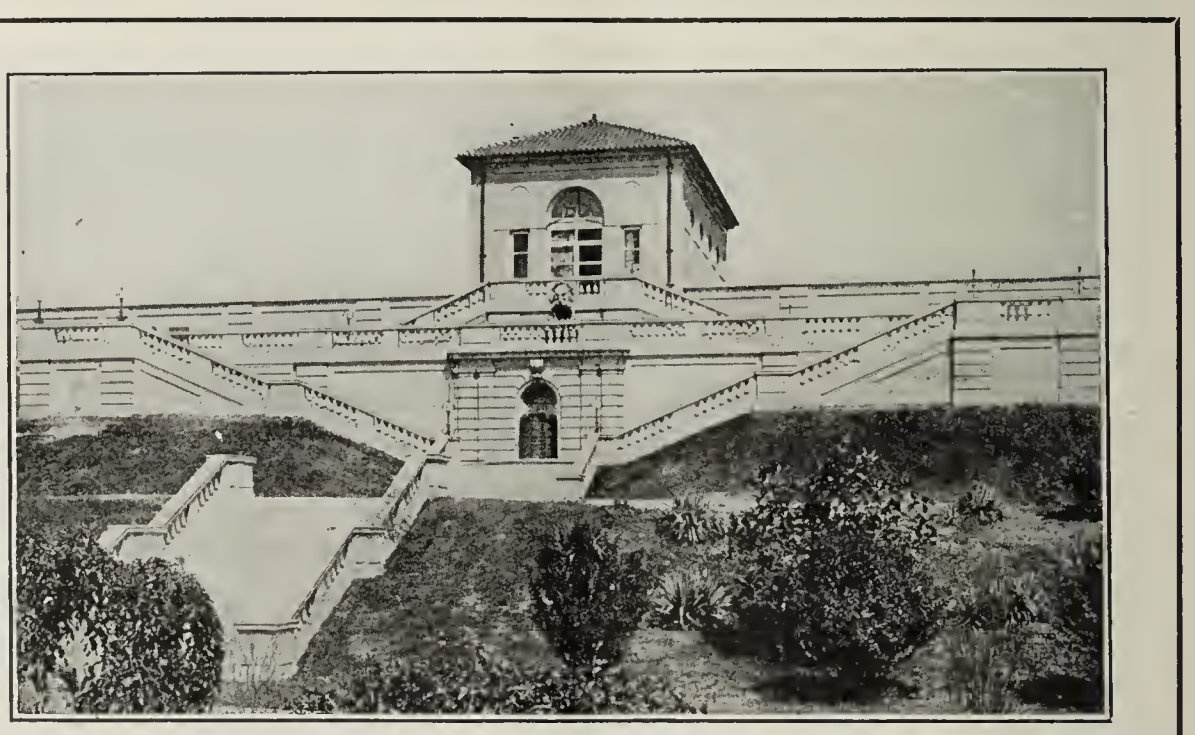
The decided advantage of adding lime to brick mortar to make it work easier is well established. This same increase in workability can be secured by adding hydrated lime to concrete mixes. As the mix becomes leaner, the advantage of the lime becomes more pronounced.

Measurement of Workability

J. C. Pearson, in charge of the Cement Section of the U. S. Bureau of Standards has recently devised the first standard laboratory test for the measurement of that elusive property "workability." He reported a series of tests at the June, 1923 Convention of the A. S. T. M. and said in part: " . . . If we use the term 'workability' to mean not merely the degree of effort required in placing concrete, but the degree of effort required in handling and placing concrete *in such manner as to give a uniform and homogeneous finished product,* then we may declare that the results of the penetration tests confirm our judgment on the workability of concrete mixtures.

"It seems to us that this is quite an important conception and one which emphasizes the proper course to pursue in selecting the type of concrete mixture for any particular purpose. Within the limits of accepted practice the consistency of reinforced concrete will generally correspond to a flow somewhere between 110 and 140. Without taking into account the increase in strength obtained by the use of less water, the penetration test indicates, as shown by the 'average' curve that there is not a great difference in *workability* between these consistencies if we take into account the work required to get an equally good distribution of concrete in the finished job. In other words, if one wants a *good* job of concreting, he can get it with a flow of 110 about as easily as with any wetter mixture. The over-wet mix may be chuted with a minimum of labor, but excessive segregation gives poor distribution unless additional labor is supplied to take care of this. On the other hand, if too dry a mixture is used, the lack or lubrication lowers the workability, and additional work must be done to insure elimination of pockets and voids."

The above statement, based on scientific tests, has been confirmed countless times in the field, and many of the leading engineers, architects, and contractors make it standard practice to add hydrated lime to practically every yard of concrete they place because of the increased workability. When lime is used in the field, less water is added to the concrete mixture, and at the same time the mobility or workability of the mass is distinctly improved. It will flow more easily through flatter chutes without spilling or clogging, and will reach



Ornamental Stairways and Basin Walls, Compton Hill Reservoir, St. Louis, Missouri. Ten pounds of hydrated lime were specified in every 4½ cubic feet of concrete.

*Construction Engineer, National Lime Association.

the forms in the best possible condition. Any number of notable examples might be cited, but lack of space prohibits.

Lime Stops Segregation

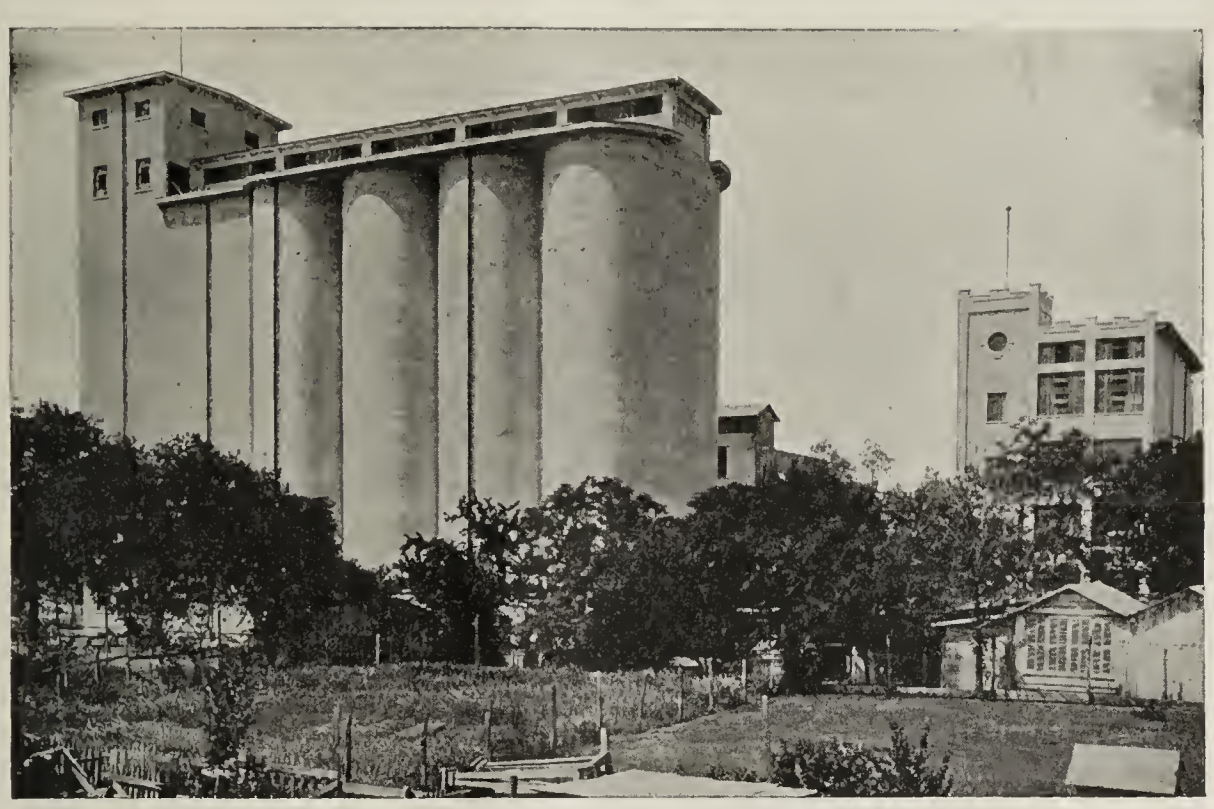
This brings us to the question of segregation. Segregation may easily become a grave danger on any job, particularly where thin sections or heavily reinforced work is encountered. It is due to several causes. Perhaps the most common cause is excess water. Certain types of smooth sands, and certain coarse aggregates, are particularly likely to induce segregation. When a particularly heavy aggregate is used, such as chats or crusher waste from zinc mines, etc., segregation is practically certain to occur unless unusual care is exercised or lime added to the mix.

The admixture of hydrated lime to the concrete produces a sticky, yet slippery mass which works and handles easily and does not separate. This property is difficult to explain except by example. Everyone is familiar with lime putty. It may be sliced or stacked in such a way as to leave a vertical face of considerable height without slumping, or in other words, it is sticky or firm enough to stand up. Step on some of that putty or work it, and it will be seen very quickly that it is extremely slippery, and easily worked. It is this stickiness which tends to prevent segregation, and the slipperyness which facilitates the working of the mass and eliminates the tendency to use an excess of water to gain fluidity.

Use in Central Mixing Plants

Central mixing plants are gaining in favor, and the practice of hauling wet mixed concrete is extending rapidly, both in road and general construction work. Dry batches are absolutely required in order to avoid loss thru excessive segregation. The question is, how dry must the concrete be? If concrete without lime is dry enough to eliminate all segregation, it is entirely too dry to be handled after it gets to the job. However, if the concrete is soft enough for easy handling when it leaves the plant, segregation may be serious by the time it reaches the work.

Practical field tests in the east have indicated that these difficulties may be practically eliminated by adding hydrated lime to the mix. This is particularly important in connection with road work. The most recent example of this was on a road job where a nine mile haul was necessary. It was impossible to handle the concrete without hydrated lime at the end of nine miles without remixing, and it was extremely difficult to get the concrete out of the trucks. The addition of 7½ pounds of hydrate with every sack of cement overcame the trouble and produced a far better job at a lower cost, the saving coming through increased speed and less work required.



Dittlinger Rolling Mill Elevator, New Braunfels, Texas. Ten pounds of hydrated lime per sack of cement insured dense concrete, smooth surfaces and good appearance.

The addition of from five to ten pounds of hydrated lime per sack of cement will delay the initial set of the concrete about fifteen minutes. This is of great value when the wet concrete is being hauled, or in connection with finishing floors or other surfaces. In form work this delay is negligible and may be disregarded.

While all concrete should be kept moist for several weeks in order to secure the best results, it is a fact that a great deal of the concrete placed in structural work is never even dampened except by rain. Hydrated lime retains a considerable amount of the water used in mixing the concrete. Evaporation does not affect this water to any great extent, but the restraint is not enough to hold it against the chemical requirements of the cement. Consequently, the lime in the concrete acts as a reservoir of water which is drawn upon by the cement during its setting and thus tends to improve the quality of the finished job.

Concrete products, such as blocks, tile, pipes, cast stone, etc., can be improved by adding lime to the mixture. A drier mix can be used, which means a stronger product. The batch is more workable, which means a more uniform and better appearing product, and the curing is improved as well.

Still another advantage of hydrated lime in concrete lies in the improved appearance of the finished work. This is due not only to the fact that the surfaces are smooth and cleaner, free from stone pockets and honeycombing, but also to the fact that the color of the concrete is somewhat lighter. Only too often a concrete structure looks dead and depressing due to the heavy gray tone. This may be lightened and a touch of life added to the whole building by adding a small amount of lime to all the concrete.

Strength Increased in the Field

Field tests indicate that in practically every instance the addition of hydrated lime to concrete mixes has raised the compressive strength. The increase in strength is greater in the lean mixes such as 1:3:6 than in the rich mixes (1:1½:3 or 1:2:4). This increase in strength is due in a large measure to the increased workability, which makes a denser concrete, and to the elimination of segregation, which makes the concrete uniform.

Practical results secured by contractors is usually the final test of whether a material is satisfactory, and when their conditions are checked and agreed to by engineers and architects, it is safe to say that the finished product is improved. Such firms as Ferr-Concrete, S. Diescher

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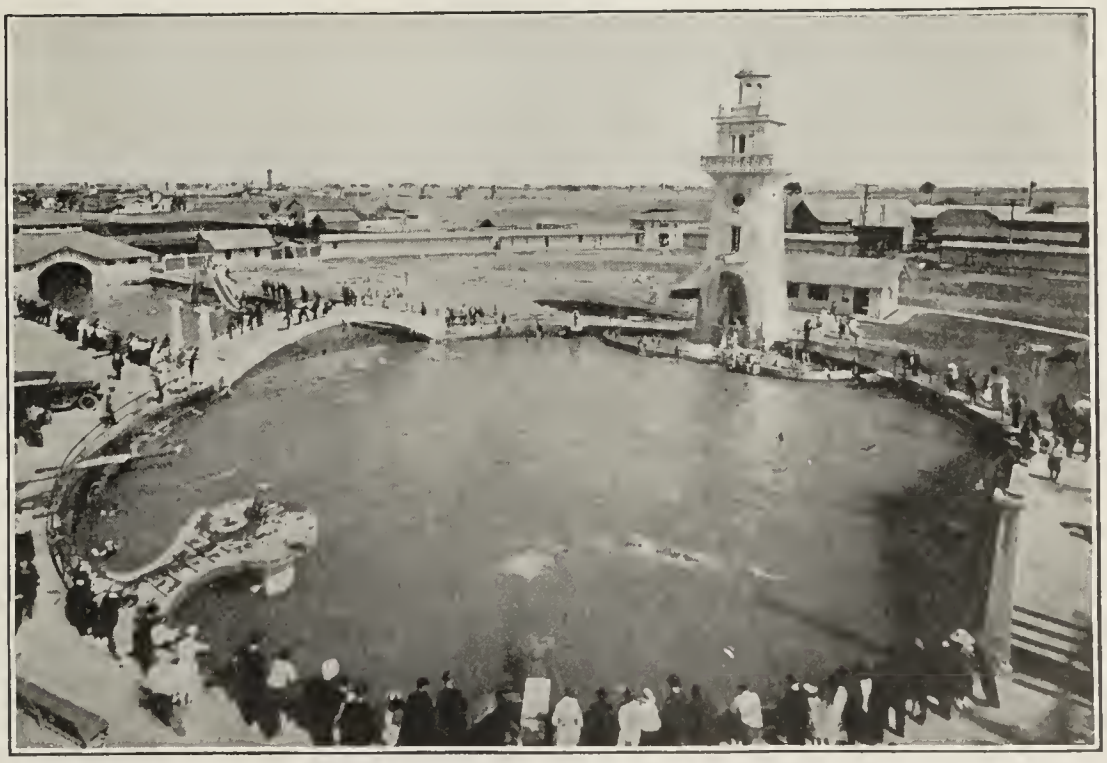

Stockton, California, Mineral Baths. Ten pounds of hydrated lime added to each sack of cement insured watertightness.

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A great genius has passed. The world has lost an outstanding engineer. We have lost a man who has helped make possible the civilization over which politicians, philosophers, and authors quibble.

Learn From Those Who Know

The world moves quickly. Before we have universally installed a method or an appliance, someone has discovered an improvement. Steam transportation was once hailed as the final word in its field. Then Haynes adapted gasoline for locomotion, long before steam had reached even its present stage of advancement. Electricity was then applied and found faster and more economical for long, heavy hauls than its competitors.

A cursory review of transportation developments during the last century will easily reveal the fact that no one thing is fully exploited by the time another has come along to supplant it.

And so it is in every line of work. Cement methods are constantly being improved. Road building procedure is being changed to yield a more satisfactory product. As a matter of fact, highway developments have of necessity been the object of much research and endeavor.

The onrush of new things and methods might confuse us were it not for the fact that civilization has not overlooked providing us with a clearing house for new information. We have been supplied with universities greater and more accessible than ever before. Everyone has the opportunity of attending them and securing the information he needs if he is to keep abreast of the times.

Winter courses and other short courses have wisely been installed to give practical men the advantages of advanced technical training when their dull seasons set in. Technical institutions all over the country throw open their doors for periods varying from a day to weeks or months, to the men who seek to improve their standing.

The University of Michigan has recently announced a most complete series of courses for road builders. Other colleges are doing likewise. The work is available usually to anyone who wants it, regardless of previous education. The attempt is made to instruct experienced road builders in new road building methods and the improvement of the old.

Such courses are eminently worth while. They merit the serious consideration of anyone who has the opportunity of attending.

Educate the Purchaser

The cement industry, just like any other productive agency is subject from time to time to violent attacks by politicians courting the public favor and by the public itself. Various indictments are concocted and false remedies are suggested and applied. We all know that any producer is entitled to a fair profit and that no one can long afford to sell the product he makes at a price barely equal to what it costs him, but the public is not looking at the producer's side. It is rather trying to get everything as cheaply as it can. It criticizes both the producer and his product.

Cement is the object of a great many unfounded criticisms. People, ignoring absolutely the law of supply and demand as a regulator of prices, insist that cement prices are too high. They further complain that they cannot get cement when they want it. The result is usually investigation and often a survey of the possibilities of state owned plants. Men who are given credit for being able to think believe that such socialistic aggression will be the panacea for all of their troubles. But they do not indulge in the mental action for which they are given credit.

The entire trouble lies in the fact, as is pointed out elsewhere in this journal, that cement must be moved at the same time that crops are going toward their markets. Freight cars are then scarce. The consumer has not so regulated his demands as to allow an even distribution of cement manufacture during the year. He has rather insisted that he get the product when he wants it, no matter what else happens. He has not seen the value of storing cement when he can get it for use later on. He has not used common sense judgment, and the manufacturer has not succeeded in educating him to the fact that the use of that fundamental simple thought will relieve him of all of his self-inflected distress.

The consumer might for his own benefit allow a little consideration for the difficulties under which he expects the mill to work. He would then be thoroughly convinced of the absolute fairness and soundness of the principles of storing cement.

Shall the State Operate Cement Plants?
VII

Let us go back for a while to the early days of our republic—back to the days of the Indian and the wigwam, the pioneers and the homespun, the beginnings of what we as a nation are industrially today. Here we find that individual effort and initiative industriously at work to wrest from nature and environment, creating from necessity and the raw materials God gave, those utilities and comforts of life that many of us today buy without giving their greatness a thought.

In those days were conceived and executed the foundations on which all of our major industries rest today. It was the individual, working alone or in groups, who conquered the forests and unknown wilds, first with his coaches and later with his smoke-belching engines. It was he who entered the fertile lands and with his ax and his muscle brought them under control. And repeatedly, when communistic efforts were attempted to accomplish the same results, they failed.

And so we have today the railroads of our country, the telephone and telegraph service of our country, and even the coal industry of our country developed to a point where they give a national service; an imperfect service at times, it is true, but a service that makes life in the order to which we are accustomed possible. And each and all of these was developed by individual effort. They were born of a young nation, a vigorous nation which had of necessity to rely upon individual effort for its life.

And in those young days and in that period of vigor and necessity the nation frequently gave aid to the new industries that were forging into the unknown. For example, huge land grants were given to railroads that had the vision and courage to extend their life-bringing ribbons of steel into undeveloped territory.

But that was yesterday. Having aided these important industries in developing themselves into a power for service, we come upon an era when the governmental thought, both state and national, has changed; where regulation instead of assistance is the keynote of political endeavor. And, because those vigorous forefathers wrought well in their effort; because the vision they had was a true vision and consequently our nation has grown in wealth and in culture to a point that is surpassed nowhere on the globe, these basic industries have been able to endure and stand up under the negative load of governmental interference and unproductive expense.

But what about the cement industry? It is merely on the threshold of life, a child in a world gone mad. Had it been born back there among the wigwams and the Indians, when vigor was demanded and permitted to exert itself in growth, it would undoubtedly today be in the position of stamina that would endure legislative quackery, but as it is it needs the opportunity which was accorded the older industries yesterday.

Not that it would not be far better to release all of our industries from the stagnant air of governmental interference and permit them to go out into the open and fight the fight of life that must be fought unhampered if service to the world is to be given, but that in the case of the cement industry there is that vital factor of youth which makes governmental interference akin to feeding an infant nicotine. The man can survive it; the child cannot.

Nor does it make any difference whether the interference comes from national or state government,—any difference, except this: generally speaking, the men in our state legislatures are men of smaller calibre and with narrower vision than those who represent us at Washington. The result is that narrower and more selfish aims are likely to dominate the actions of our state politicians: their outlook is circumscribed by their desire for favor with their constituents, their ability as business men is limited, in the large, by small town activities. They are not captains of industry, but captains of politics on the turbulent sea of opportunism.

It is the principle that is dangerous to the industry of our nation, whether it finds expression at Washington, D. C., or at the various capitals of our various states. What has proved a failure in a national way will most likely prove a failure in a state way: and in both cases the public foots the bill in inefficient service, added taxation, and industrial demoralization.

What the cement industry has to offer this country has not yet been dreamed. Its opportunities for service are unlimited, unless it is killed on the day of its birth by the death-dealing touch of state government interference. It needs encouragement, not restraint; exhibitions, not prohibitions. We are learning the importance of these distinctions in the rearing of the human child; they are as important in the development of the industrial child.

It is the individual working in cement that can have the visions and the courage to turn them into action and productivity; it is the individual who should be encouraged by opportunity to hazard his time and finances in the development of cement to its logical importance. Therefore it is more vital than in other industries already under the ban of the government's greed for power that that touch be left off of this industry.

We need cement. We need ideas in cement. We need development in cement. We cannot have them unless individual effort be allowed to exert itself. We cannot have them if the states are to step in, mix politics with ignorance and build concrete highways with votes instead of with engineering knowledge.

An Efficient Modern Sand Plant

A Description of the Methods and Apparatus Used by the Ohio River Sand Company to Reduce Cost of Handling to a Minimum

The Ohio River Sand Company, of Louisville, one of the largest and most prosperous sand and gravel organizations in the central west, just recently completed the major portion of a new sand and gravel unloading plant at its Riverside yards and headquarters just east of the steamboat landing on the Ohio River at Louisville. The improvements cost around $250,000, or at least the work that has been done and continuation of the belt conveyor system out over other sections of the yards, along with replacement of the old steam unloading plant now used as an auxiliary will bring the cost up to around that figure.

The improvements were handled by the Brown Hoisting Machinery Company, of Cleveland, O., which designed the plant, and installed the equipment. This plant is erected for unloading sand and gravel barges as they come in to the company's private landing from a point a few miles east of Louisville, where the company keeps two dredges or digger boats busy pumping sand and gravel from the bottom of the Ohio River, it being washed on the dredge boats, loaded into wood and steel barges and towed to the local landing.

For years the method of unloading was by an incline. A derrick boat, equipped with a clam shell bucket, lifted sand and gravel from the barges and placed it in a hopper on a float. Elevation to the yard, or hoppers on the hill, was accomplished by means of small cars, operated by a cable on the incline. The power used in this plant was steam. After reaching the top of the incline, which was several feet above the yard surface, the cars were switched over trestles to various yard piles, or hoppers, the bottom released, and the contents dropped. These cars were given a good yank with the cable as they came over the top of the incline, and traveled largely by the speed thus developed to point of unloading, but had to be hand shoved back to the power plant, which was a slow and unsatisfactory method.

The old plant is standing and at present is being used principally for unloading sand, but will be replaced with a more modern plant later on.

The new plant is known as a "Bridge Crane." A steel bridge is built on the river bank extending back into the yard. The crane, electrically operated, travels on rails but over the water's edge, drops its bucket to the barges, picks up a load, and returns to the shore side, where the contents are dropped into a concrete hopper, which in turn feeds a belt conveyor system. The system is chuted so that the material can be belt delivered directly into cars on the company siding, or carried to almost any section of the yard, and delivered into hoppers or yard piles, as the belt system works on trestles.

A barge contains 250 cubic yards of material, and gravel weighs around 3,000 pounds to the yard. Figured in tons a barge contains about 375 tons. The crane has an unloading capacity of around 200 tons an hour. It is electrically operated throughout, being equipped with three 150 h.p. Westinghouse motors.

The motor power and equipment for operating the bridge crane is all contained in the bridge house, hung at a giddy height above the ground. The Thomas Elevator Co., of Chicago, furnished the car puller equipment, which is powerful enough to handle a considerable string of cars, as they are slowly filled with gravel and kept moving as the load is installed. A Merrick Weighometer, made by the Merrick Weighometer Co., Passiac, N. J., is used in weighing cars, and weighs the loads as they pass over the belt conveyors to the car loading chute. The belts used are made by the Manhattan Rubber Co., New York, and are thirty-six inches in width, the plant having been equipped with these belts.

The new concrete hopper installed has a capacity of about 2,500 cubic yard, or ten barges, it being divided into six compartments for handling various sizes of screened gravel. Loading to trucks is done by gravity from the bottom of the hoppers. The company at the present time is loading around twenty cars of gravel daily for shipping to nearby points, besides taking care of its big local business handled through the yard hoppers.

For years the company has been using Red Strand cables, of the Leschen interests, St. Louis, in handling operations of its steam plant and boat operations, and specified Leschen cables wherever steel cables were used in erection of the new plant.

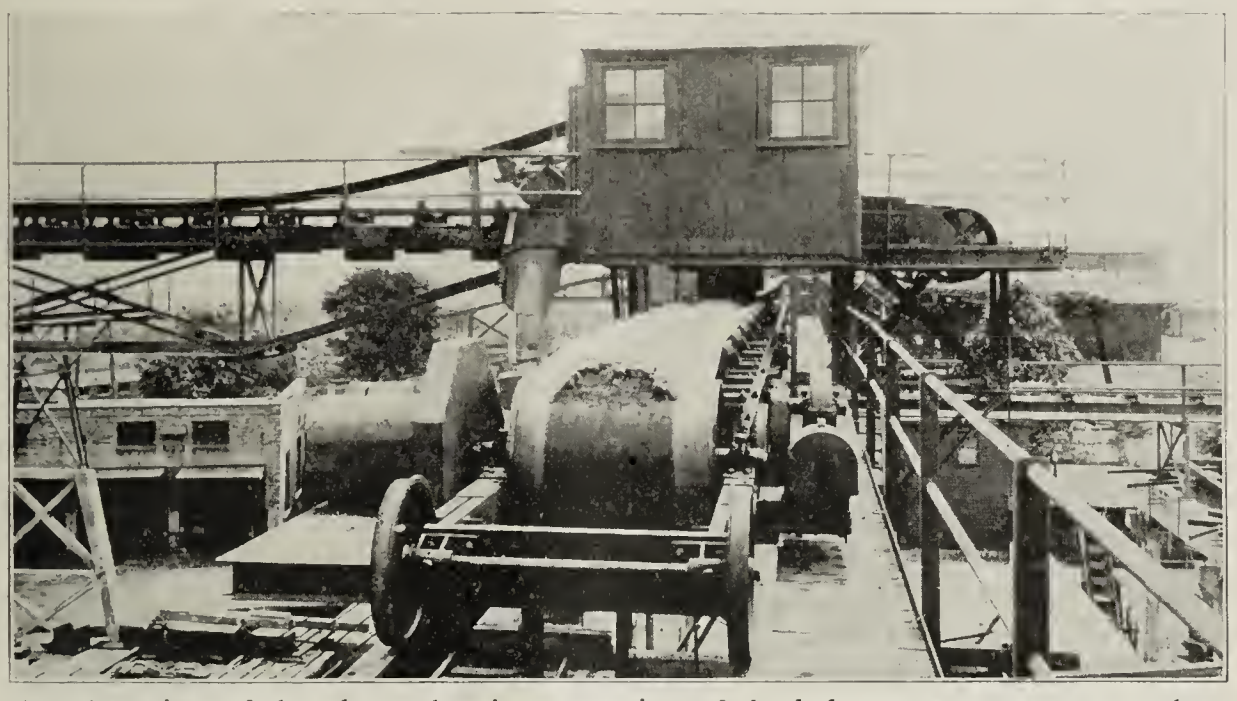
The present river equipment used in dredging or sucking up sand and gravel from the bottom of the river and transporting it to Louisville, included fifteen wooden barges, four all steel barges, one

A view of the "Bridge Crane" plant of the Ohio River Sand Company at Louisville. An electric crane picks up its load from barges and drops it into the concrete hopper to be fed to the belt conveyor.

steam towboat, two dredge boats, one unloading digger boat at the receiving plant, and one pump boat, used to keep the hulls of the fleet clear of water during the winter period, when put up in the canal, or behind an island where they will be safe from ice jams.

In some years river digging is possible almost through the year, although digging is not often handled at a maximum depth of more than twenty-feet. Cold weather and ice stop operations, as the stuff freezes in the barges as loaded, and cannot be taken out except by steam thawing, and incidentally means great hardships for the workers. When heavy ice begins to run it means destruction of boats and equipment, with the result that in late November or early December digging generally comes to a stop and all equipment is placed in a safe ice harbor until the following spring, this also giving the company a chance to overhaul worn machinery and make repairs which would be almost impossible during the busy season.

As a rule sand and gravel are taken from the river at a point about eight miles above Louisville, there being a fairly wide cruising radius for the digger boats, which sometimes operate four or five miles out of the city and again at close to twelve miles. While sand companies sometimes buy property or lease sand and gravel rights, as a rule property owners are tickled to death to make an arrangement with the companies to sell them sand and gravel on the basis of $3.50 per barge load for all material removed. Some owners of property along the river will not allow removal of sand or gravel, on the claim that in deeping and widening the channel it means eventually shortened shore lines and loss of property, but above Louisville there is a county road extending along the river for several miles and neither road nor bank show any signs of being undermined. For one thing the action of the water fills up the sand and gravel beds gradually as they are dredged out and they are ripe again for further cleaning within a short time, as the supply is endless and the current is steadily sweeping loose stuff into the holes made by the dredge boats.



Another view of the plant, showing a portion of the belt conveyor system used.

The dredging operations are about the same as found in river sand handling at any point, except that all material is handled by suction nowdays, whereas years ago it was handled by clamshells. Transportation is merely a question of connecting a steam towboat to the barges, and bringing them to destination, and moving the empties back. Unloading on a river bank where the stage of water is hardly ever the same for twenty-four hours, however, presents some difficulties. Any equipment used must be so arranged that it can take care of a difference of thirty feet or so between high water and low water.

The crane bridge of course represents economical construction, and the first of its kind seen in this section, which has a good many coal as well as sand and gravel unloading plants unloading river barges. The reduced cost of handling in this way will prove a considerable item, in addition to the increased speed of handling, which is a big item where high priced labor is used.

Foreigners Accused of "Dumping" Cement

WASHINGTON, Oct. 28.—Acting on petitions filed by the Sun Portland Cement Company and the Oregon Portland Cement Company, the customs division of the Treasury Department has announced an investigation of the dumping of cement in this country by European manufacturers in violation of the anti-dumping act. Complaint has been made especially against the importation of cement from Norway and Sweden.

E. W. Camp, director of customs, in a communication to the collector of customs at Portland, Ore., states that representatives of the Treasury Department abroad have been instructed to investigate and report as soon as practicable the foreign market values back to April 1 of British, Norwegian, Swedish, Danish and German countries. All importations of cement should be carefully considered in this connection."

The director stated that when dumping notices are issued a redelivery bond should be required and appraisement reports withheld pending further instructions from the department. As the four invoices submitted by the collector show that formal appraisement has been made, the director said, dumping notices can not now be issued for the shipments they cover.

Under the anti-dumping law additional duties can be assessed upon importations when it is established to the satisfaction of the Treasury Department that foreign goods are being dumped into the United States at prices below the cost of production and with the purpose of ruining a domestic industry.

Dr. Steinmetz Dies

Dr. Charles P. Steinmetz, consulting engineer for the General Electric Company, Schenectady, N. Y., died suddenly on October 26. He was famous as an inventor and electrophysicist. A recent western speaking tour probably had had a direct effect upon his health.

Dr. Steinmetz was born in Breslau, Germany, in 1865 and came to the United

States in 1889 after having gotten into trouble over socialistic writings while a university student.

Over two hundred inventions, most of them relating to alternating current devices and power transmission, coupled with an active interest in civic affairs, caused the life of the great engineer to be a busy one. He was also a professor at Union College, and held an honorary Master of Arts degree from Harvard and an honorary Doctor of Philosophy degree from Union.

Workers Increase

WASHINGTON, Oct. 28.—Monthly employment figures of the Bureau of Labor Statistics of the Department of Labor indicate increased activity in the cement industry in September in comparison with August.

Seventy-one cement plants reported a total of 22,118 workers on their pay rolls in September as compared with 22,014 in August. The amount of the weekly pay roll in September was $652,882 in comparison with $643,460 in August, or an increase of 1.5 per cent. The per capita earnings in the cement industry were one per cent greater in September than in August.

Illinois Block Plant Uses Modern Methods

Use of Finer Manufacturing Developments Makes for Better Product and Higher Profits

During the past few years the business of manufacturing precast concrete units for building purposes has made tremendous progress. This progress is not only evident in the growing popularity of the units and the increasing demand for them in all types of building construction but also in the methods and machinery used in their manufacture.

The manufacture of concrete block by hand methods is almost obsolete. The scarcity of satisfactory labor to perform this work and the high rate of pay demanded by unskilled labor, makes it necessary for the manufacturer, in order to make a reasonable profit from his business, to obtain more block per man per hour than is possible by strictly hand methods.

Hand Methods Obsolete

One man mixing his own concrete by hand, shoveling it off the floor into the mold box of a hand machine, tamping the block by hand, carrying them to a curing room and later on carrying them out to the storage yard can hardly be expected to average more than 120 block per day. He may for a short time actually make block at a higher rate than this but when it is considered that he must stop to mix concrete and carry the finished block from curing room to storage yard, his average daily production will probably be less than 15 block per hour. Such a low rate of production makes the labor cost per block excessively high and while a man may make fair wages he cannot expect to earn large profits from his business.

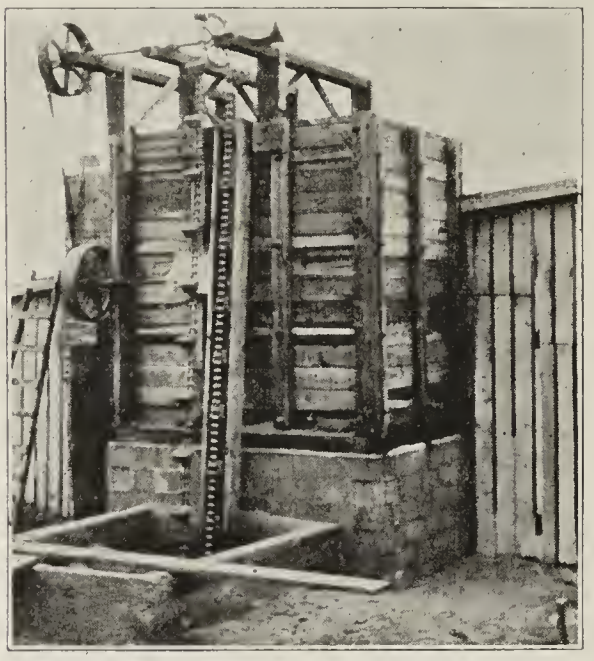
The user of hand methods labors under another great handicap. He cannot accept orders for anything except the very smallest work as his production is so restricted that he cannot make satisfactory delivery on large construction. Normal growth of his business is hampered by his limited production and unless he outfits himself to take care of the requirements of his customers, they will go to his competitors for satisfactory service.

The Selection of Equipment

In making the change from hand methods to more modern methods of production the manufacturer should study his problem carefully and purchase equipment that will satisfy the requirements of his growing business. The purchase of equipment is an investment and the purchaser should use great care is securing the permanency of his investment.

Before making final selection of equipment for use in a concrete products factory the purchaser should make certain that the equipment selected possesses certain qualifications that experience has proven absolutely essential. A block machine, mixer or any other piece of equipment should, first of all be built ruggedly enough to withstand the heavy duties imposed upon it by concrete work. With sturdy construction should be combined the utmost simplicity of design. Complicated mechanisms require constant expert attention and are frequently the cause of expensive maintenance charges and costly shut downs.

Production capacity of a machine can be properly judged by only one standard—production per man per hour. A machine



Bucket elevator supplying feeding hopper.

capable of turning out 180 block per hour, but requiring 6 men in the plant for its successful operation is not as efficient as a machine making 120 block per hour, and requiring only 3 men. In one case the production per man per hour is 30 block and in the other 40 block.

The installation should eliminate so far as possible, slow back-breaking manual labor in all the operations of block manufacturer. Reduction of manual labor not only materially lowers production cost but in times of labor scarcity or industrial unrest, the user of labor saving equipment has less difficulty in retaining competent workmen.

Another important qualification of concrete block making machinery is the ability to produce block of high quality. Concrete should be thoroughly consolidated and the finished block, including the fractional sizes should be uniform in size and true to square. A machine should be adaptable to the various sizes required by the trade and changes from one size to another should be readily made.

Another important consideration for the purchaser of equipment is that of buying only such equipment as can be used when it is desired to still further expand the manufacturing plant. It is poor economy to buy a machine one season and then discard it for a machine of larger production capacity the next year. A final qualification is that equipment should not be excessive in price. Good equipment is worth what it costs but unsatisfactory machinery is expensive at any price.

The various appliances in the plant should be closely correlated. There is no economy in having a block machine capable of a high rate of production if the methods of off-bearing finished block are such as to cut production far below the capacity of the machine. The flow of materials from the aggregate bin to the finished block in the yard should be at a rate comparable with the speed of the block making machine.

Description of a Typical Plant

The plant of A. C. Wesse of Dalton, Ill., is typical of intelligent and conservative expansion from hand methods of production to modern methods. In making the change Mr. Wesse has greatly speeded up the production per man per hour and has consequently lowered his labor cost per block. He is in a position promptly to take care of the present local demand and should this demand increase, as it is almost certain to do, his present equipment will become a satisfactory unit in a larger plant. He has accomplished this result with a comparatively small investment. The wisdom of his course may be judged by the fact that three months after making the installation of power equipment this spring, his additional profits due to lower

Left—A special Barrett lift truck is used for conveying block from machine to curing room. Right—a view of the storage yard showing life truck rack on concrete runway.

labor costs and a greater volume of business done, were sufficient to completely pay for all the new equipment. He has demonstrated that labor saving equipment is not an expense but is a very profitable investment. The installation at Mr. Wesse's plant was furnished by the Thomas W. Noble & Company, 35 S. Dearborn St., Chicago, and is typical of the equipment this company recommends for manufacturers desiring to convert their plants to power methods.

The System Used

All aggregate is delivered to the plant by motor truck and upon arrival is dumped directly upon a feeding hopper which is sunk in a concrete pit below the ground level. This hopper operates in conjunction with a small Link-Belt bucket elevator. The bucket elevator is of the single chain type and is equipped with 4 by 6 in. buckets spaced at intervals of 18 ins. It conveys the sand to an overhead bin having a capacity of 5 cu. yds. Only 2 h. p. is required to operate the elevator.

The aggregate passes by gravity from the overhead bin into the hopper of a No. 2 Kent continuous mixer.

One of the great advantages of the Kent continuous mixer is that it requires very little attention on the part of the operator so that he is free most of the time to assist the machine operator in off bearing the block. In order to insure a perfect mix, Kent mixers, furnished by Thomas W. Noble & Co. are equipped with a 3-ft. extension to the trough and a correspondingly long mixing shaft. The mixed concrete is discharged from the mixer on to the automatic elevator to the Universal Block Maker where it is conveyed to the feeding hopper of this machine.

Description of Block Maker

In the design and construction of the Universal Block Maker there are embodied every feature necessary for the successful performance of a concrete block machine. The machine is extremely sturdy—a highly important feature when the exacting requirements of concrete work are considered. The structural steel frame in which the working parts of this machine are hung consists of 4-in. steel angles. The total weight of the machine is in excess of 3,000 lbs. The mold box unit or block machine is built up of extremely heavy castings and weighs in the neighborhood of 800 lbs. A mold box unit of such weight, cannot break down under a power tamper or get out of square. To insure complete consolidation of the concrete, the tamp bars are unusually heavy, striking a blow equivalent to 85 lbs.

The machine fulfills another essential qualification by being extremely simple in design. There are no complicated parts to get out of order or require the services of an expert mechanic and consequently there are no costly shut downs. It is rarely necessary to send to the factory for a new part as practically all parts can be replaced at a local machine or blacksmith shop.

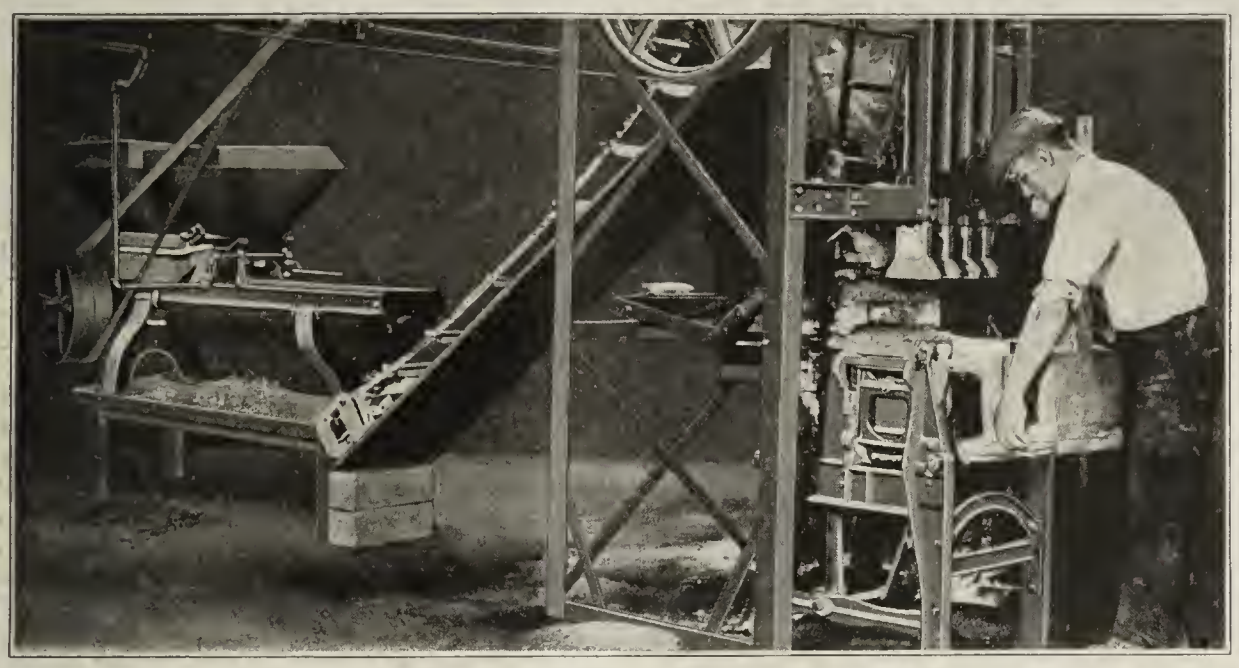
In addition to its sturdiness and simplicity the Universal Block Maker has an extremely high rate of production. With three men, one man operating the mixer, one the machine and one off-bearing, a production of 100—standard 8x8x16 in. concrete block per hour is absolutely guaranteed. The guaranteed production is frequently exceeded.

One of the special features of this machine that makes for a high rate of production is the ease with which the mold box is opened. In the manufacture of plain block the end gates remain stationary and the block is stripped past them. The mold box is opened by a single natural movement, the block pivoting upward and outward in such a manner that its weight assists in its removal.

Another feature contributing to rapid production, is the fact that all slow back-breaking, disagreeable shoveling of materials has been eliminated. The concrete is automatically elevated and automatically fed into the mold box. Surplus material is carried back into the feeding hopper and does not litter the floor, necessitating handling the same material twice.

The Universal Block Maker is a down face machine and is adaptable to all standard sizes, including 4, 6, 8, 10 and 12 in., by 8 by 16 in. block. The change from one size to another can be very readily and quickly made. Concrete is thoroughly consolidated by the heavy tamped bars which have a stroke of 14 inches. Fractional block are made as rapidly as full size block and due to the fact that dividing places are carried by split cores and are held rigidly in place by grooves in the back and front plates, all fractional block are absolutely true to square.

A great advantage in installing the Kent mixer and Universal Block Maker similar to those shown in Fig. 1, is the fact that while this equipment forms a most efficient and economical manufacturing unit in the plant desiring comparatively small production, it becomes an equally efficient unit in a large plant. The No. 2 Kent mixer will serve two Block Makers and if it is desired to extend the plant, an additional block maker can be added and the entire original investment conserved.



Complete manufacturing unit installed in plant of A. C. Wesse of Dalton, Ill., by Thomas W. Noble & Co. Materials flow from aggregate bin to finished block without manual labor.

Off Bearing the Finished Block

In order to keep pace with the production capacity of the machine, the off-bearing facilities have been carefully considered in this plant.

A concrete floor is laid throughout this plant and the lift truck system of conveying the block is employed. Racks are built on a special design furnished by Thomas W. Noble & Co. and are of extremely sturdy construction. A special Barrett lift truck equipped with super spring frame and rubber tires is used in conveying the green block from the machine to the curing room.

One of the great advantages of the lift truck method is the fact that it is less expensive than any other method of conveying block. The necessary racks can be built by the manufacturer himself at low cost and a lift truck is very moderately priced. It should be remembered, however, that for handling block in their green state, a very special type of lift must be used. A slight jar might cause the green block to crack so that the truck must be equipped with special spring frame and the wheels with large rubber tires.

Although it might be argued that the cost of a concrete floor throughout the plant is an item that should be charged to the cost of the lift truck system, nevertheless, a concrete floor should be considered as an essential feature of a block plant because of its cleanliness and neatness whether the lift truck system is used or not.

Side view of Universal Block Maker illustrating ease with which mold box is opened.

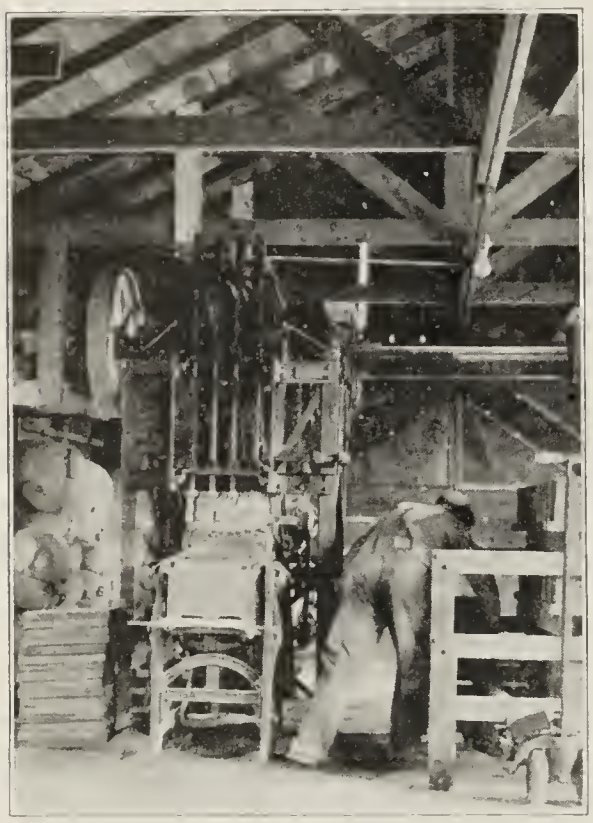
After the green block have been conveyed to the curing room, the racks or platforms upon which the block rest are gently lowered to the floor by an extra stiff hydraulic check with which this

truck is equipped. After curing, the lift truck is again brought under the racks and the cured blocks pulled out into the storage yard over concrete runways which are laid for that purpose.

Concrete runways in the storage yard are built at intervals of not to exceed 14 ft., so that the maximum distance the block are carried from racks to storage pile is not greater than 7 ft.

Publicity, Sales and Service

Although this article has devoted itself particularly to describing modern methods of production, it should not be supposed that the work of modernizing a plant has ended when an efficient and economical method of producing block and storing them in the yard has been developed. Block must be sold at an advantage. The growing manufacturer



Front view of Universal Block Maker showing how operator places finished block on racks by taking only one step from machine.

must study his methods of publicity, sales and service as intently as he devoted himself to manufacturing methods.

Publicity consists of creating a favorable impression every time the buying public comes in contact with the business. Letterheads, statements, business cards and other stationery should be selected that will be in keeping with the dignity and solidity of a going business enterprise. Regular newspaper advertisements, preferably illustrated with cuts of concrete block buildings will prove profitable investments. Another very attractive way of advertising is to place on buildings in course of construction, neatly lettered cards, stating plainly the name and business address of the firm supplying the concrete block.

If the product is occasionally tested for strength and absorption by a reputable testing laboratory, the result of such tests form advertising matter of exceptional value.

In the final analysis, the service rendered by the finished product and by the manufacturer himself, determines the success and future expansion of the business.

Quality block made with modern labor saving equipment intelligently advertised and backed up by courteous and competent service is the goal toward which manufacturers of concrete should strive.

Adjust Freight Rates

WASHINGTON, Oct. 28.—The Interstate Commerce Commission has held that the proposed reduced rate on cement in carloads from Bonner Springs, Kan., to Kansas City, Mo., is justified.

Under a schedule filed to become effective April 29, 1923, the Kansas City, Kaw Valley & Western Railway proposed to reduce the rate on cement in carloads from Bonner Springs, Kan., to Kansas City, Mo., from 6.5 cents to 4.5 cents per 100 pounds and to increase the minimum from 60,000 to 80,000 pounds. Without protest and upon the initiative of the commission operation of the reduced rates was ordered suspended until Sept. 26, 1923, and subsequently Nov. 25, 1923.

The cement mill of the Kansas Portland Cement Company is located on the line of this railroad. On the opposite side of Kansas City the Missouri Portland Cement Company has a mill on the Santa Fe at Cement City, Mo., near Sugar Creek, Mo. In a previous case the Interstate Commerce Commission held that the same rates should apply from Sugar Creek and Bonner Springs for line hauls in all directions. The railway involved in this case represented that as a result of the rate adjustment heretofore in effect Sugar Creek possesses an advantage of two cents on shipments of cement to Kansas City and that this has resulted in a reduction of the cement tonnage shipped from Bonner Springs.

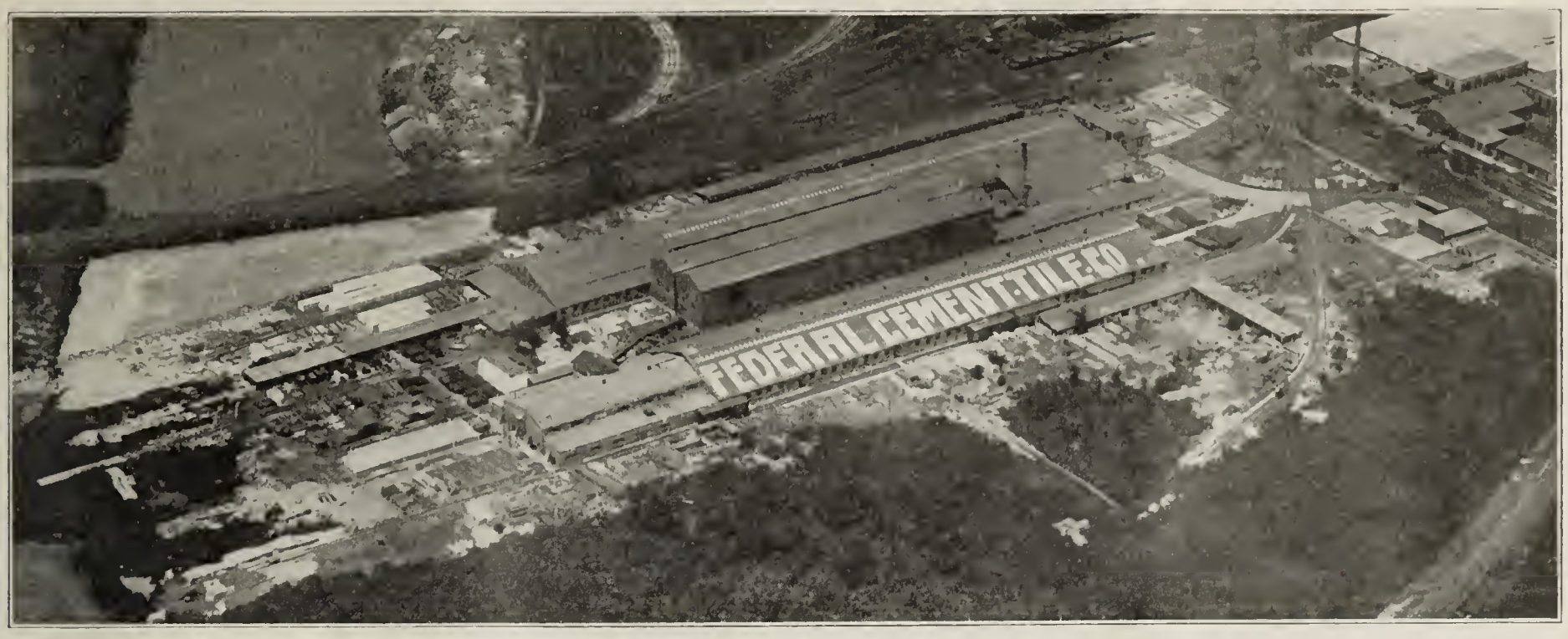
Develop Handling Equipment

In the field of concrete handling equipment there is a new development of the mast hoist bucket plant, made by the Insley Manufacturing Company of Indianapolis. This is the steel mast boom plant, involving the use of a quarter or half yard hoist bucket mounted on a sectional steel mast. It is designed for use on operations where the concrete yardage to be placed is from 500 to 3,000 cubic yards.

The bucket is hoisted on one face of the mast, and on the opposite face the chute system is hung. The bucket is dumped automatically upon striking a headframe, which can be set at any level. This headframe carries a small hopper to regulate the flow of the concrete, and a 5 foot section of chute to convey it into the head of the first section of chute. The first 30 foot section of chute is seated at the upper end on a bracket, and supported at the lower end by a cable which is tied back to a bridle higher up on the face of the mast. This chute is in effect a boom. The bridle and bracket are connected together by shoe angles, which makes the assembly a sliding frame. Thus the relation of the boom chute to the bridle and bracket is fixed, with the result that the entire assembly can be moved up or down at will. An additional section can be hung from the lower end of the boom section, which provides a pouring radius of 60 feet from the face of the mast with no floor supports.

The steel mast is designed for a height of 140 feet, and is manufactured in standard 20 foot interchangeable sections. A steel gin pole is provided for erecting the mast.

New mast hoist bucket plant.



An airplane view of the factory and grounds.

A Growing Indiana Tile Plant

Efficient and Economical Methods of Manufacture Combined With Service Help to Make Product Popular

Formerly the ordinary concrete products plant consisted of an old barn, a load of sand, and a little cement. Even now a lot of them comprise nothing more, but many have grown into full fledged industrial establishments.

The Federal Cement Tile Company, of Hammond, Ind., manufacturers of high grade cement roofing tile, represents the latter type of organization. Its eighteen acres, located practically in the heart of the industrial region of the middle west, form the site for one of the biggest plants of its kind in the world.

In 1906, when the firm was started, an old packing plant was used for the manufacture of the tile, but two years later the acquisition of new ground and a new building was made necessary by the growing demand for its product. At that time shop number 1, a building 400 feet by 100 feet, was erected. In 1912 another structure of the same size was found necessary, but that did not meet the demands for long. At the present time the plant has four acres under roof, including one building 840 feet by 100 feet, another 640 feet by 100 feet, these two representing the original buildings with subsequent additions, a permanent sand storage bin, which takes care of four hundred cars of sand for use over winter months, a steel cutting room, a power plant, and numerous other smaller buildings.

About 6,000 squares monthly or 72,000 squares yearly, costing the buyer about $20.00 to $25.00 per square, of various kind of concrete roofing are made and erected with the output going up so rapidly that predictions for the future are not possible. As a matter of fact, production has, since the beginning of manufacture, consistently outstripped manufacturing facilities, as each addition to manufacturing possibilities has brought more than a proportionate increase in business. Although major additions have just been completed, more are now being started with a view toward again materially increasing the capacity of the plant.

The Federal Cement Tile Company is, strictly speaking, an organization rather than a factory. Here the principle of employer and employee working for the common good has met with unusual success. Workmen seem proud to be able to say that they are Federal men, and the superintendent, George Geyer, takes pride in his men. As the writer walked through the factory he inquired casually of several of the workmen as to how long they had been on the job. He asked five men, and got the following answers: "five years", "fourteen years", "nine years", "fifteen years", and "eight years", a remarkable record for a plant situated where labor is normally shifting from place to place at frequent intervals. Mr. Geyer explained this unusual situation by telling of many ways in which the company has done work in behalf of the men so as to make them satisfied. Later in the article we will take up a few of the more important methods.

Employs Three Hundred Men

The plant is an efficient and up-to-date one. It is located right on the main line of the Monon railroad, so that with its mile and a half of private track, running along both sides of each building, shipping is made easy. One hundred and fifty men are employed in the various phases of manufacture, while one hundred and fifty others are kept busy all year round erecting roofs in various sections of the country. Eight engineers are constantly at work planning the industrial roofs for which orders have come.

Federal tile, although sometimes made in special orders, comes in three main standard sizes and types. The 24 in. x 52 in. pitched roof type, the red tile, is one of the most popular. Then there is the 24 in. x 60 in. ordinary flat roof type, and the 18 in. x 96 in. flat roof channel tile type. All tile is well reinforced, both by steel mesh and steel bars made by the American Steel and Wire Company, and is designed to carry an evenly distributed load of from 275 to 300 pounds per square foot. Each week a sample is taken from each lot and tested, so that any defects in manufacture are checked.

The plant uses one car of Universal portland cement and four cars of sand each day, in addition to requiring a great deal of reinforcing material, coloring matter, oil for saponifying the pallets, and various other materials which enter into the manufacture of the tile.

A three ton Box traveling crane and a three ton Pawling & Harnischfeger traveling crane, each electric and equipped with a one ton clamshell bucket, take the torpedo sand from the cars and drop it into a gravity chute leading into the storage house. A Stephens-Adamson belt conveyor with cleats helps to keep the pile centered in the storage bin. The same cranes are used to supply the gravity feeds leading to the mixing room. From the gravity feed a Link-Belt bucket conveyor carries the sand to a screen, from where it drops into a feeding hopper. Here the automatic hoppers feed cement and sand, in 1:3 proportions, into a sixteen paddle continuous mixer. Just enough moisture is added to make the mixture cake when squeezed with the hand. The mix is then dropped underground, and is carried by a Stephens-Adamson belt conveyor under the railroad track into the molding building. It is here taken up an incline and discharged into Koppel ball bearing 24 in. gauge special hoppers. The hoppers drop the material into specially constructed batch cars running on a narrow gauge industrial track along the shop to the molding benches. Each worker is supplied with a new batch of the mix about every twenty or thirty minutes, according to the speed with which he is working.

Tile Carefully Made

The molding tables have been specially constructed to accomodate the special palettes. The palette is placed on the table and half of the required concrete is placed and tamped. It is then lightly sprinkled and the reinforcing is put in place. Now the reinforcing is tamped so

as to surround it with moisture and consequently with a homogeneous mixture of fine sand and cement, and then a wire brush is passed over it vigorously to make sure that the cement is thoroughly packed around the mesh. The second layer of mixture is then added and the tile is finished off. One helper is supplied to every four tile makers. He now catches the tile in a crane and swings it around to the storage pile, where it remains on the palette for forty-eight hours. It is then removed and put in new storage piles, where it is watered every day for three weeks. After thirty days the tile is sufficiently dry and set to allow safety in shipping.

In taking care of storage, the designer of the plant, I. H. Freund, the vice president, has hit upon an efficient scheme. Each building is divided lengthwise into what may be termed three bays, or three equal longitudinal portions. In the center portion all manufacturing takes place, so that the portions to either side may be used for storage. This, of course, cuts the maximum distance which any tile has to be moved exactly in half, effecting quite a saving of time, effort, and money.

The heavier tiles, of which the channel type forms the major portion, are handled by Q. M. S. No. 5 air cranes, operated by Sullivan air compressors. In handling the lighter types air was found too expensive and hand cranes the least expensive, as the helper was necessary anyway and had plenty of time to take care of the hand cranes.

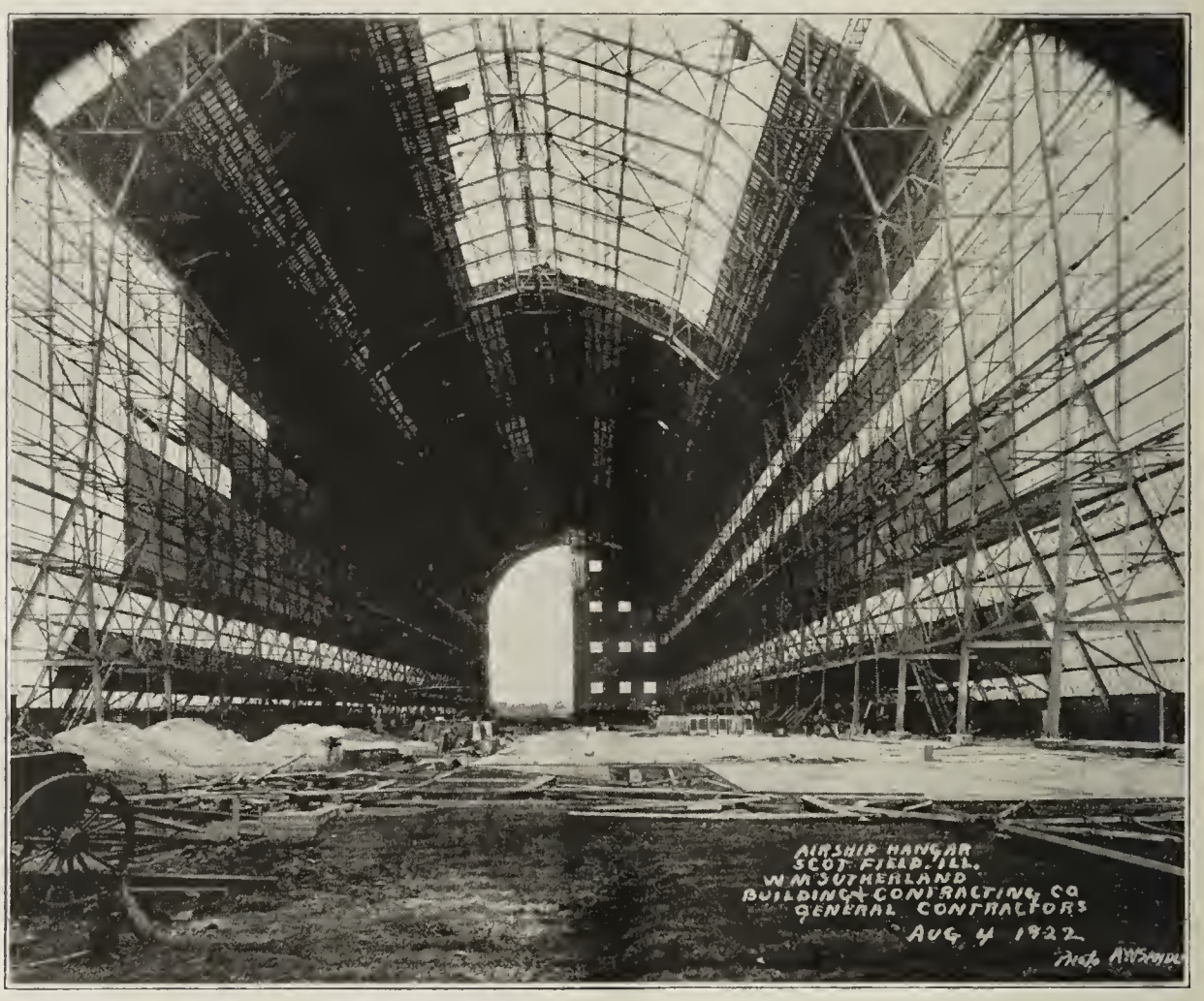
After the palettes are removed from the tile, they are cleaned and oiled for further use. In handling the oil an efficient scheme is also used. An elevated tank, which holds a tank car of oil, supplies feed pipes leading to all parts of the factory. Sufficient pressure is maintained to allow the use of sprays, so that oil is applied to palettes and cores in remarkably short time and with little or no waste.

In making its 24 in. x 52 in. pitched roof type tile, the company has, under direction of LeRoy Baumgarte, treasurer of the company, assembled a machine which is all but human. Palettes are fed into one end of the mechanism on a conveyor and brilliant red tile emerges from the other almost perfect in composition and shape. During the process the machine puts on the bottom layer of plain concrete mix, tamps it, puts in the reinforcing, secures it, puts on the layer to which the red coloring has been added, tamps it, takes off the excess, adds a layer of pure coloring matter for penetration, and then adds and finishes the final layer of coloring, consisting of fine sand and red oxide ground together and moistened, and places the tile on a conveyor leading to the storage room. Two men stand at the outlet to trowel off a few of the rough edges, but other than that nobody touches the tile at all. Sixteen men are required to keep the machine running, but with its assistance they do work which would require over forty highly paid expert hand tile makers.

A Production Stimulus

Mr. Geyer, in speaking of this machine, told an interesting anecdote about how they had increased its production. It seems that when it was first installed it could produce under pressure only an average of 362 tiles a day. The men said they could run it no faster. The machine, however, represented an investment which would have to perform more diligently if it was to pay, so they introduced a bonus scheme, by virtue of which the hourly rate for all men working on the machine was stepped up in direct proportion to the daily output. Within sixty days eight hundred and fifty tile were being produced each day, and the men had doubled their salaries. Since then various refinements in design have increased the capacity to one thousand a day, while further improvements now under way are expected to step up production at least twenty-five per cent more. The output of the machine even now necessitate a tremendous storage space for tile being cured, so that additions are also planned to this building to provide necessary increased facilities.

The buildings themselves are indeed modern, and extremely convenient. They are so constructed as to get away as far as possible from the necessity of employing human labor to move material or tile. All material, in fact, is handled by conveyors, and is dropped in each instance by gravity chutes to required central loading points. Gravity conveyors handle the tile in storage. Slots, which are closed when not in use, run all along both sides of each building. Through these the tile are run on Mathews roller conveyors to cars placed on the sidings. In cases where the tile is finished on contract time, but the general constructors on the job have not yet advanced far enough to allow placing the roof, the tiles are run out into storage spaces in the yards and held until they may be shipped.



A Federal roof being put in place in the airship hangar at Scot Field, Ill.

Use "Waste" Material

All structures are of reinforced steel and absolutely fireproof. Moreover, there are some made of waste materials. Each day the waste concrete which is left over after the day's work and which cannot be used in the high grade tile, is gathered and used for sidewalks all around the place. When it is not needed for that, night men make concrete brick of it, and it is of this brick that some buildings have been built. Thus what is waste in most plants has been put to work in making additions at the Federal factory.

As was mentioned in the first part of the story, the plant has always tried to keep its employees satisfied. It decided quite awhile ago that it was important that its men should go home all cleaned up. The return of dirty workmen to their homes causes dissatisfaction on the part of their families, dissatisfaction later on the part of the workmen, and consequent increased labor turnover. So the Federal plant has installed ample showers to take care of its men. Not only that, but it has provided an outdoor shower room and swimming pool for their use during the summer months. The old pool, constructed some years ago, has become so popular that a new and larger one is now being constructed. This too, is being made out of slabs which have been labelled "seconds" and waste material.

Three times a week the executives and foremen gather in consultation to talk over means of bettering the efficiency of the plant and the conditions of the workmen. But the latter need seldom be discussed, as the labor seems well satisfied. Wages are high enough to provide a comfortable living, and the hours are pleasant. The men start to work at seven in the morning, are allowed a ten minute luncheon period at nine o'clock, have a half hour for lunch, and quit at three thirty, thus allowing them time for recreation while the sun is still shining.

Keep Accurate Records

The Federal Cement Tile Company has had unusual success in marketing its product. Perhaps that is because it is so sure of its quality. Every tile is marked with the date, the name of the maker, and is rigidly inspected. Office records are kept on every single piece, so that if

(Continued on page 50)

Portland Cement Output in September

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Buchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for September, 1923, were made necessary by the lack of returns from one plant. September production is the highest for any month, but shipments, although higher than one year ago, were exceeded in certain months in 1922 and 1923. Stocks are higher than in September, 1922.

Production, Shipments, and Stocks of Finished Portland Cement, by Districts in September, 1922 and 1923, and Stocks in August, 1923, in barrels.

Commercial District	Production September 1922	Production September 1923	Shipments September 1922	Shipments September 1923	Stocks at end of Sept. 1922*	Stocks at end of Sept. 1923	Stocks at end of August, 1923*
Eastern Pa., N. J. & Md.	3,124,000	3,293,000	3,431,000	3,780,000	1,153,000	1,630,000	2,118,000
New York	643,000	726,000	791,000	788,000	370,000	490,000	552,000
Ohio, Western Pa. & W. Va.	1,172,000	1,327,000	1,435,000	1,495,000	416,000	301,000	469,000
Michigan	656,000	876,000	667,000	838,000	155,000	223,000	185,000
Ill., Ind. & Ky.	1,659,000	1,893,000	1,706,000	1,927,000	649,000	395,000	428,000
Va., Tenn., Ala. & Ga.	468,000	779,000	482,000	731,000	292,000	279,000	231,000
Eastern Mo., Ia., & Minn.	1,124,000	1,367,000	1,282,000	1,408,000	328,000	621,000	662,000
West. Mo., Neb., Kan. & Okla.	864,000	1,009,000	930,000	1,001,000	630,000	653,000	645,000
Texas	365,000	367,000	330,000	305,000	152,000	220,000	159,000
Colo. & Utah	230,000	293,000	225,000	244,000	179,000	163,000	113,000
California	776,000	909,000	783,000	874,000	209,000	256,000	220,000
Ore., Wash. & Mont.	343,000	270,000	382,000	307,000	191,000	261,000	298,000
	11,424,000	13,109,000	12,444,000	13,698,000	4,724,000	5,492,000	6,080,000

*Revised.

Stocks of clinker, or unground cement, at the mills at the end of September, 1923, amounted to about 3,379,000 barrels compared with 3,759,000 barrels (revised) at the beginning of the month.

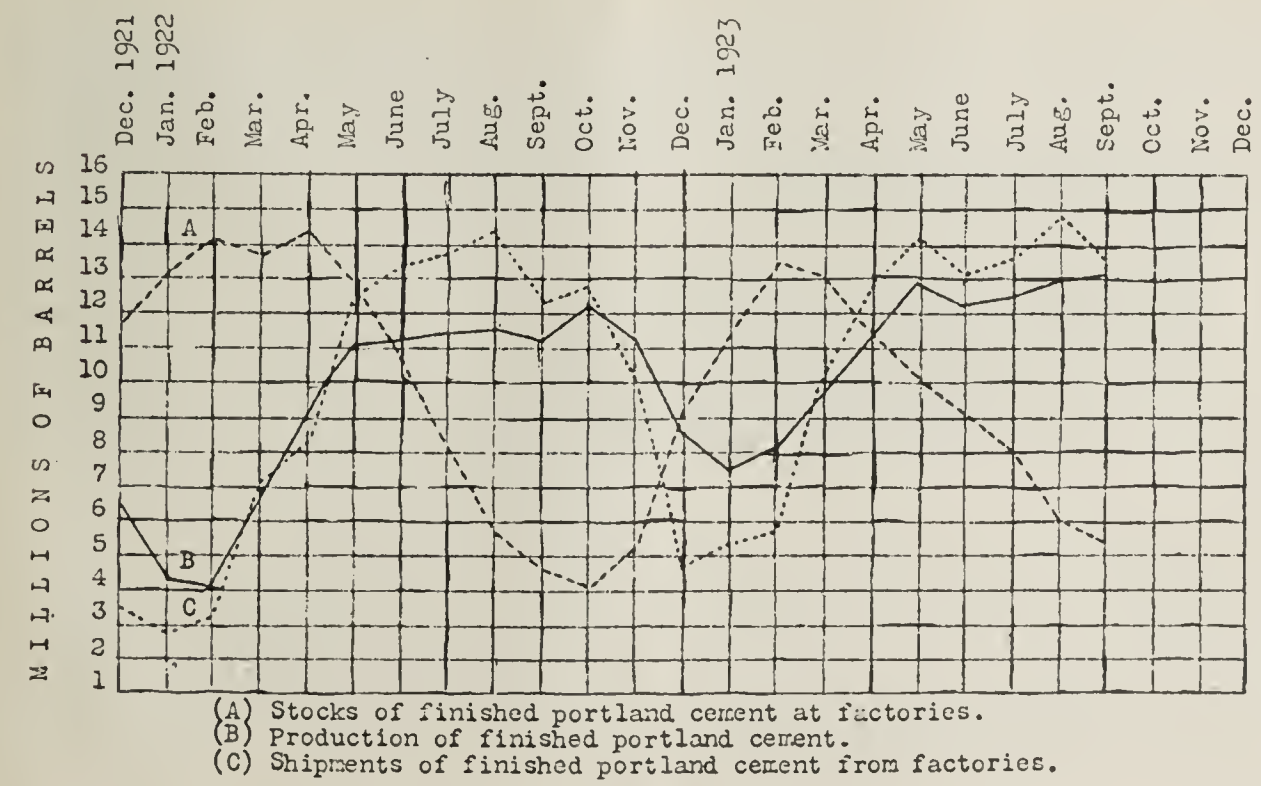
Production, Shipments, and Stocks of Finished Portland Cement by Months in 1922 and 1923, in Barrels.

Month	Production 1922	Production 1923	Shipments 1922	Shipments 1923	Stocks at end of month 1922*	Stocks at end of month 1923
January	*4,291,000	7,704,000	*2,931,000	5,419,000	13,316,000	*11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	*13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	13,848,000	*12,045,000
First quarter	15,254,000	25,669,000	13,218,000	21,708,000	.....	.....
April	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	*11,463,000
May	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	*10,144,000
June	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	*9,168,000
Second quarter	21,664,000	36,651,000	34,811,000	40,518,000	.....	.....
July	11,557,000	12,620,000	13,850,000	13,712,000	8,433,000	*8,081,000
August	11,664,000	12,967,000	14,361,000	14,971,000	5,746,000	*6,080,000
September	11,424,000	13,109,000	12,444,000	13,698,000	4,724,000	5,492,000
Third quarter	34,645,000	38,696,000	40,655,000	42,381,000	.....	.....

Imports and Exports of Hydraulic Cement, by Months, in 1922 and 1923, in Barrels.*

Month	Imports 1922	Imports 1923	Exports 1922	Exports 1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	111,559	96,263	77,203
July	957	286,106	119,491	82,774
August	56,757	323,948	105,156	73,201
September	‡42,641	(†)	78,615	(†)
October	§65,228	.....	80,402	.....
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823		1,127,845	

*Compiled from records of the Bureau of Foreign and Domestice Commerce. †Imports and exports in September, 1923 not available. ‡Covers period Sept. 1-21. Imports Sept. 22-30 included with Oct. §Includes imports period Sept. 22-30.



(A) Stocks of finished portland cement at factories.
(B) Production of finished portland cement.
(C) Shipments of finished portland cement from factories.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in August, 1923, amounted to 323,948 barrels, valued at $562,688. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in August were from Norway, 80,914 barrels; England, 71,954 barrels; Denmark, 56,149 barrels; Sweden, 51,949 barrels; Quebec Province, Canada, 46,319 barrels; Belgium, 12,427 barrels; Germany, 4,063 barrels; other countries, 173 barrels. The imports were received in the following districts: Los Angeles, 121,681 barrels; Florida, 33,314 barrels; Oregon, 32,808 barrels; Porto Rico, 29,906 barrels; North Carolina, 26,213 barrels; Buffalo, 21,441 barrels; Vermont, 14,816 barrels; San Francisco, 11,569 barrels; St. Lawrence, 8,817 barrels; other districts, 23,383 barrels.

The exports of hydraulic cement in August, 1923, were 73,201 barrels, valued at $219,072, of which was sent to Cuba, 39,197 barrels; to the other West Indies 4,145 barrels; South America 13,538 barrels; Central America, 6,084 barrels; Mexico, 4,568 barrels; Canada, 1,606 barrels; and to other countries, 4,063 barrels.

The statistics of imports and exports of hydraulic cement in September, 1923, are not available.

Conduct Stucco Tests

WASHINGTON, Oct. 28.—The Bureau of Standards has issued a summary of the status of investigations connected with cement stucco. The summary follows:

"During the past ten years investigations have been conducted at the bureau with the object not only of improving stucco but of developing more permanent and pleasing finishes of this type for residence construction. The results of this work have formed the basis to a large extent of the 'Recommended Practice for Portland Cement Stucco' adopted this year in revised form by the American Concrete Institute.

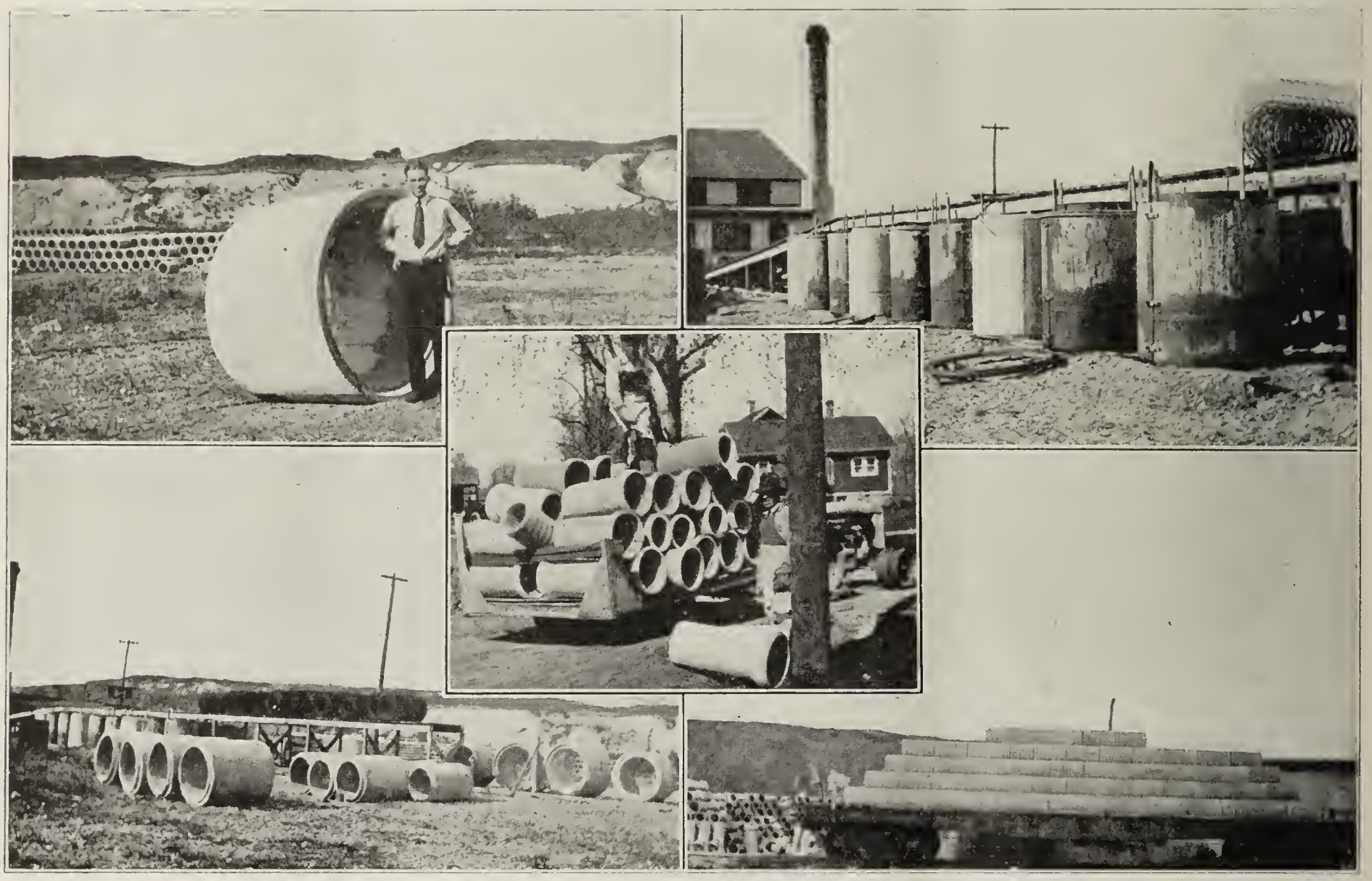
"In the summer of 1922 a group of ten new experimental panels, each approximately 9 by 16 feet, was erected on the bureau's test structure to compare the effects of various types of reinforcing lath and fabric, commonly used as bases for cement stucco. While these panels were a disappointment in respect to freedom from defects, they served to concentrate attention upon the importance of the method of attachment of the lath or fabric to the supporting woo dframe, and also to the value of applying and 'curing' the stucco according to correct principles.

"The suggestions from the 1922 investigation, together with a mild controversy as to the merits of sheathing versus no sheathing on stucco houses, led the bureau to plan a new investigation which might establish with greater certainty some of the questions now in dispute. Upon taking up the matter with interested associations and manufacturers, a very lively interest was shown, and as a result the cooperation of the National Lumber Manufacturers' Association, the Portland Cement Association, the Associated Metal Lath Manufacturers, and a number of individual manufacturers of wire lath and fabric has been obtained in furthering the investigation.

"The work is now in progress and involves the replacement of thirty-two of the old panels on the stucco test building. New panels will be erected during the favorable weather conditions which usually prevail in Washington at this season, and it is expected that these will be completed early in November."

Learning From the Experience of Others

Directors of a New Corporation Visit Concrete Products Plants to Secure at First Hand Modern Methods and Practices



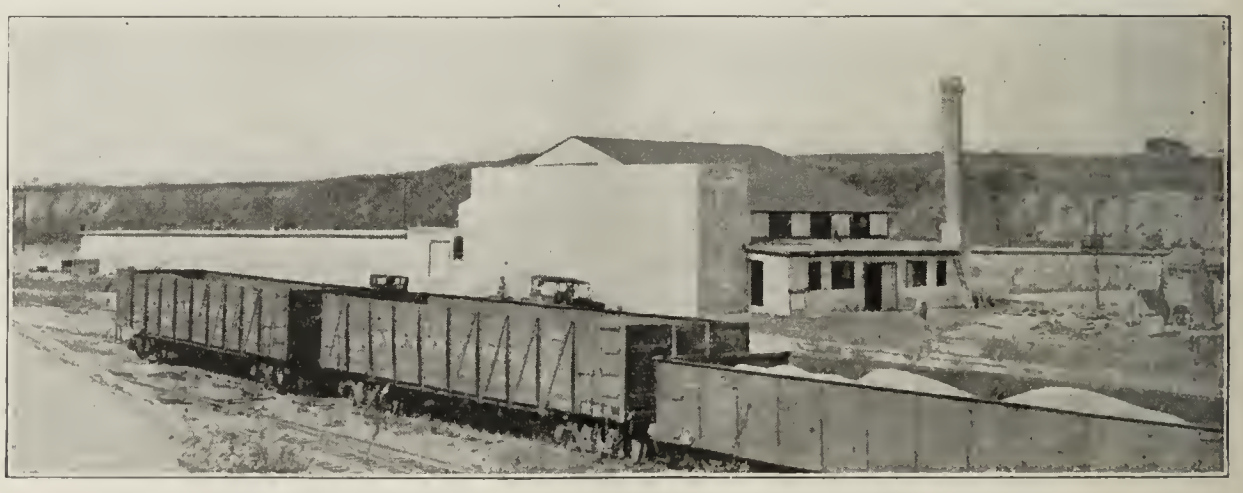
Upper left—Showing the 54-inch reinforced pipe made by the Illinois & Wisconsin Concrete Pipe and Tile Company, Beloit, Wis. Upper right—Molds for the 54-inch pipe. Center—Fordson Tractors with trailers carry the pipe to the job. Lower left—27, 48 and 54 inch pipe awaiting shipment. Lower right—Showing method of loading the 15-inch drain tile on flat car.

The Acme Concrete Products & Gravel Company of Cement City, Mich., has recently been incorporated and is proceeding with the work of planning and establishing one of the largest plants in Michigan for the manufacture of concrete products.

Late in October a party of the directors of the new corporation undertook a trip of inspection among established plants of Illinois and Wisconsin with a view to securing the experiences of their owners in the matter of machinery, methods and sales programs. The itinerary included several points in northern Illinois, among them Mooseheart, recently described in this journal and was completed at the plant of the Illinois & Wisconsin Concrete Pipe and Tile Company located at Beloit, Wis. This factory, which has been built adjacent to the gravel deposits of the Atwood-Davis Sand Company of Beloit, has acquired a national reputation for the quality of its product.

The plant, which has been in operation since May 2, 1921, has been successful from the start, this being due to the efforts of G. B. Harker the general manager who is responsible for the layout and the methods in use at this model plant and Chas. E. Richardson, the general sales manager, who disposes of the output.

Upon arriving, the travelers found a scene of bustling activity owing to the fact that the plant was under pressure to complete several accepted contracts. This pressure has been in effect for a considerable time because the demand for the products of this factory is such that it compels the management to maintain production at top speed. When the travelers arrived it was raining hard, but in spite of that they were enabled to spend an interesting and instructive day at this location.



A view of the plant showing main building.

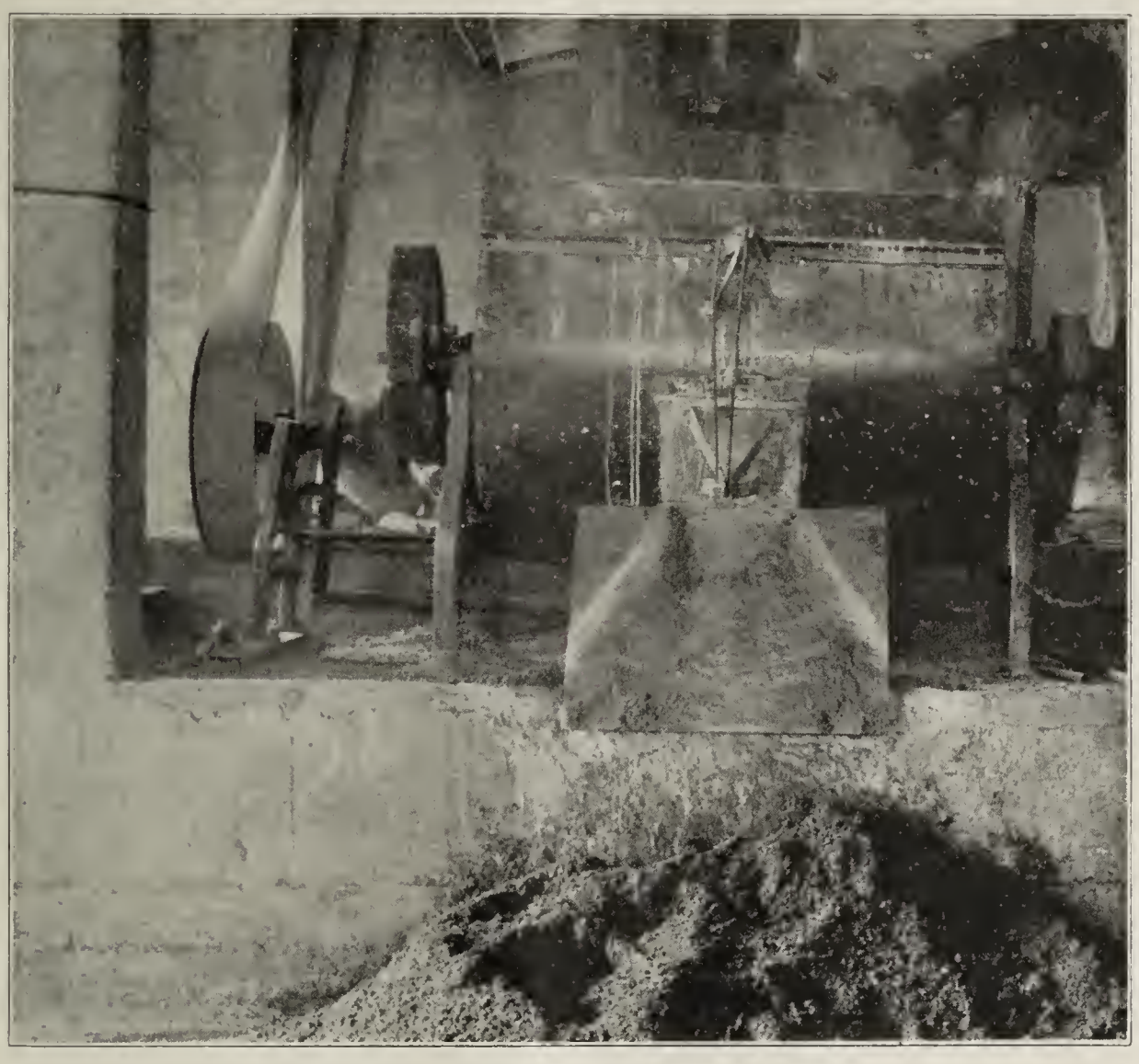
The factory building proper is two stories in height and is 56x56 feet square. Adjoining this building are several curing chambers into which the finished product is placed as soon as manufactured. These curing chambers are being built and added to the main structures as needed, several of them having been added since the establishment of the factory. The necessary steam is furnished by a 35 h. p. Kewanee boiler.

The aggregate for the plant is secured from the adjacent property of the Atwood-Davis Sand Company and is handled in a specially constructed car which travels between the gravel pit and

the plant and is usually propelled by an Ohio locomotive crane, which unloads the car and places the aggregate in the storage bin. This bin is divided into compartments containing the various sizes necessary for the making of pipe. The aggregate bin is placed so that it empties into a No. 14 Blystone mixer.

A cement storage house is also placed near this mixer so that all of the component parts of the concrete mixture are easily accessible.

Another interesting feature of this plant is located at this point. It is the apparatus used for cleaning cement sacks. For this purpose a machine manufactured by Joseph Wirth, of Fon du Lac, Wis., is used and the visitors were given an opportunity of seeing the amount of cement that could be saved by using a cleaner as well as the excellent condition of the sacks which were to be returned to the cement mill for credit.



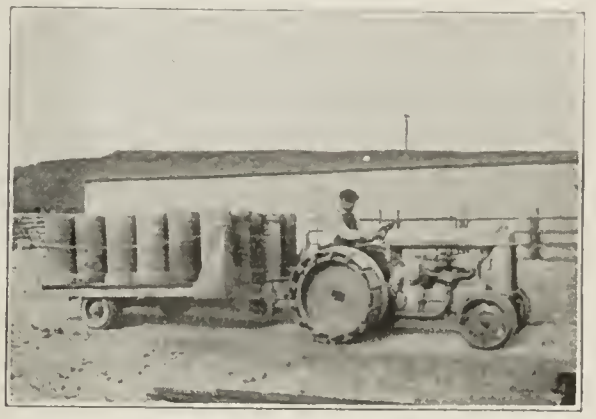
Arrangement for dumping Blystone mixer.

The McCracken Pipe Machine.

After the mixture has been thoroughly worked in the Blystone mixer it is dumped into a depression in the floor from which leads a Link-Belt chain elevator which conveys the mixture into a McCracken pipe molding machine. In the process of manufacture a steel casing in which the pipe is formed is placed under the machine. A revolving packer head descends and the concrete which has been elevated by the machine mentioned is automatically delivered within the casing. When the packer head reaches the bottom of the casing a revolving bell packer rises and when the bell has been packed the packer head gradually rises and the bell packer goes down. The concrete is fed evenly and in exactly the quantity required. When the packer head is again at the top of the casing the pipe is complete. At this juncture a two wheeled lever arrangement is applied to trunnions on the side of the casing and the completed pipe is then lifted from the machine and transferred to one of the drying rooms.

One of the features of this plant is the manner in which the finished product is stored and handled. Fordson tractors equipped with trailers, an overhead electric crane, and derricks with block and tackle are all used with a view of eliminating as much as possible any human labor. By the use of this machinery the plant is enabled to accomplish wonders in the storage and rehandling of the finished product. The visitors were greatly impressed with the completeness of the arrangement of this plant and made copious notes for use in the new plant projected at Cement City.

It so happens that the new plant will be similarly situated in that its owners expected to build it adjacent to a gravel deposit. The new plant has the additional advantage of being located as an immediate neighbor to one of Michigan's largest cement plants. It thus will have all of the necessary raw materials at hand.



How the pipes are transported.

The visiting party was given the opportunity of seeing the immense amount of work which could be accomplished at the gravel pit and of the machinery with which this plant is equipped. For example, they saw in operation a Bucyrus steam shovel, a Marion steam shovel, an Ohio locomotive crane and the necessary switching was done with a Davenport dinky locomotive. They also inspected the crushing, screening and washing plant which makes seven sizes over fourteen screens. Twelve of these are Gilbert screens manufactured by the Stephens-Adamson Company of Aurora, Illinois.

Those in the party were Norman B. Horton, state senator, of Fruit Ridge, Mich.; August G. Matthes, manufacturer of concrete products, Adrian, Mich.; W. H. Burnham, for many years president of the Peerless Fence Company and director of the Adrian Steel Casting Company; Harry A. Fee, president of the Citizens Light & Power Company, Adrian, Mich.; J. F. Werner of Bronson, Mich.; John L. Senior, president of the Peninsular Portland Cement Company, Cement City, Mich.; E. W. Dienhart of the Portland Cement Association and a representative of this paper.

Homer M. Hadley, district engineer in charge of the Portland Cement Association office at Seattle, sailed for Japan, October 5, to make a thorough investigation of how modern structures, particularly those consisting largely of reinforced concrete, withstood the recent earthquake.

Mr. Hadley is particularly well qualified for a mission of this kind, having for many years specialized in structural engineering. Before joining the forces of the Portland Cement Association, his practical experience included a number of years with some of the foremost engineering firms on the Pacific coast. Shortly before coming with the Portland Cement Association, Mr. Hadley was structural engineer for the Seattle School District.

Mr. Hadley's trip will probably require three months or more absence from his official duties with the Portland Cement Association, although it is expected that very soon after his arrival in Japan he will be able to cable a condensed preliminary report that will reconcile a number of conflicting messages which have been sent out, leaving us thus far mostly in doubt as to just how modern structures in Japan withstood the earthquake.

Things That Make the Customer Buy From You
V

By John Lee King

When a man marries, they say, his troubles begin. I'm not so sure of that myself but at least, if he believes in adding somewhat to the population of the world he finds himself occupied with nursing bottles, coughs, putting youngsters to bed, and whatnot—at least I have. The result is that the old free life of "come and go as you please" disappears and the man settles down to be a steady part of the community—one of those Ultimate Consumers whom you wish to sell.

In my courting days, for example, it was not uncommon for the two of us to see two shows a week. Now, without misrepresentation, we are lucky if we see two a year. Yet just this week I contracted for eight hundred odd dollars worth of concrete work, and in those courting days I didn't buy a nickel's worth. In other words a lot of the young fellows who don their best bibs and tuckers on a Saturday night, tuck a box of sweets under their arm and march off to sing sweet nothings into the ear of a Sally or Marie may eventually be prospects for you, but most likely are not prospects at present.

But to get down to the whole thing that is responsible for most of the type on this page. I started out for a convention the other night, to leave Chicago at 11:30. I didn't go home, but for the first time in six months deserted the fireside, the nursing bottle and the coughs and went to a show. Perhaps it was because I've fallen out of the habit of seeing shows that this light comedy struck me as hitting the mark, but at any rate I'm using it as the basis of these columns this month.

The show is called "Polly Preferred" and you may have seen, or may see, it. I hope you have, or do, and that you will agree that the philosophy underlying its conception if put to work in your business will conquer the Ultimate Consumer to your heart's desire I'll only tell that portion of the story that applies to the subject in hand.

The hero had been a salesman of women's silk underwear and although strong for women, he was not interested in silk underwear. Result, he was fired—since, being uninterested in his job, he did not make a success of it.

The heroine—at the risk of seeming impolite I intentionally mention her second—is a chorus girl who, because she does not care to be classed as a "naughty" one, underdresses her part and fails to put herself over. She is fired in order that one of the backers of her show can give her part to a girl with more "class."

Hero and Heroine meet in a restaurant over a cup of coffee. Mutual bad luck opens the way to conversation, and the hero springs his big idea.

He sizes the girl up, convinces himself that she has the possibilities of a real actress, and tells her he wants the job of selling her as a business proposition. He tells her all they need to do is have faith in her ability, dress her up to look the part, and seek the market where such "goods" as she are in demand, and that their fortune is made.

Finally she takes him up. He borrows fine clothes for her, she attracts attention, and he puts her over as a phenomenal success as a motion picture actress. And to make it short and sweet, after the plot has run through the necessary three acts, he loves and marries her and probably in the course of time he, too, will be holding a nursing bottle and tying a rag around a child's throat to cure a cough.

When he left underwear the hero was listless and indifferent, but when he tackled the job of selling Polly Preferred—Polly who wasn't even what she pretended to be, although she had the possibilities, but was a down-and-out chorus girl—you ought to see the vim and fire that he put into the job. He carried the world before him and the Ultimate Consumers fell over themselves in an effort to get stock in Polly.

Sure, a good looking girl in a good looking gown is a far different thing from a bin full of cement, but I wonder whether the successful selling of one, as a business proposition, differs so much after all from the other. I've seen a waitress in a restaurant put real interest and enthusiasm in serving a plate of pork and; I've seen a newsy stand on the street corner and cry his wares with as much belief in his importance and the value to the world of his commodity as a President of these United States might have. Then why can't the same faith and belief be placed behind concrete?

Of course, if you don't like selling silk underwear, you'd better follow the Hero's lead, and get out.

But why isn't there enough to be proud of, to put faith in, and enthusiasm into your present business? Ribbons of concrete are stretching across our country in every direction, making neighbors of all of us and affecting materially the social life of the nation; homes are being finished with the same material and within their walls men and women are holding nursing bottles for children that one day will rule and continue this land of ours; viaducts and bridges are being constructed of this material; we are, in fact, approaching the concrete age.

You are dealing in a commodity that comes close to the Ultimate Consumer, that affects him more and more as time goes on. Even today the half has not been told; there are uses to which concrete will be put that have not yet become known. You are in an industry that is returning the city-dweller to the country and bringing the farmer to the town to do his shopping; thereby, that same industry is changing distribution methods of staple goods, besides bringing about a better understanding between the city and the country man. Land, man! seated comfortably in your office chair, with a pipe of ripe tobacco sending its smoke ceilingward, this humdrum business of yours, if you are foolish enough to view it as such, can be seen as a living romance of no mean proportions.

And if you can see it as such—if you can visualize the Flannagans and Steele's piling their six youngsters into their Ford or Pierce Arrow and going from the heat of the city to the cool of a shaded, concrete, country highway; if you can hear the cradle songs being sung in houses incased in stucco; if you can feel the throb of industry, concrete enclosed—then, what under the sun of heaven do you need further to give you that pep and enthusiasm for your business that will make you irrestible to the Ultimate Consumer?

It isn't the product you sell that makes the difference: its the attitude you take toward it. While the Hero above mentioned was being fired by the silk underwear sales manager, another of his men, fired with his job, was probably making a big sale. There's a man out in Seattle who got all stirred up about the possibilities of nut meats—Brazil nuts, pecan nuts, walnuts, and all the rest of the tribe. He created the Nut House and is selling his goods all over the country today.

There are men in towns the size of yours, with people of the same make-up as those in your community, who are reaching the Ultimate Consumer to the tune of a growing business and ever-increasing bank account. The cement is no different from that which is in your warehouse. The difference, if their success is greater than yours, probably can be found in that difference in attitude.

Certainly if you don't like the business, you're in a poor way to make me like it; if you can see the romance, you can make me see it. So while I go to hold that nursing bottle, I hope you'll give a few moments thought to the question of whether or not you are sold on your job.

If you are, the Ultimate Consumer will also be sold.

Study Oil Effect

WASHINGTON, Oct. 28.—An announcement by the Bureau of Mines of the Interior Department describes an investigation of the use of mud fluid and cement in oil and gas drilling operations as follows:

"A combined laboratory and field investigation of the use of mud fluid and cement in oil and gas drilling operations is being made by the Department of the Interior at the Petroleum Experiment Station of the Bureau of Mines at Bartlesville, Okla. The work is being done by M. J. Kirwan, assisted by M. B. Cooke, and C. I. Huss. This work has a number of purposes. It is desired to determine the rate and amount of penetration of mud fluid into formations of various textures and porosities under different pressures. The physical and chemical characteristics of mud fluids are also being studied together with their relation to the use of mud fluid in wells. The effect of adding so-called 'peptizers' (chemicals to prevent or accelerate the settling of mud) is being studied as well as methods of treating mud to finely divide the clay particles so that the mud will enter fine grain sands. A study has been made of 'loading' mud fluids to give higher specific gravities and thus make them more effective in holding down high pressures in wells.

"Numerous experiments have been made on oil well cements. The effect of high ratios of water on the tensile strength of cement was studied. This included an investigation of the time of initial and final set. The effect of pressure on the time of initial and final set was observed. Several brands of cement were studied with reference to their use in oil wells.

"In addition to the laboratory work, field observations have been made, and conditions under which mud and cement were handled and placed in the Tonkawa oil field were studied. This investigation should be of value, as it will furnish fundamental data of importance in oil well mudding and cementing. The results of the investigation will later appear in a bulletin by Mr. Kirwan."

State Profits by Use of Good Machinery

North Carolina Concrete Road Building Project Is Marvel of Efficiency and Saving—Only Part of Fifty Million Dollar Program

In constructing a concrete road in North Carolina recently, the Royer-Ferguson Company, Inc., of Winston-Salem tackled the problem of labor saving in a highly successful manner in that they accomplished this by the use of the various machines which are available to the up-to-date contractor.

In the matter of unloading freight cars, formerly a job for low grade human labor, subject to human failings, a fifteen ton Brownhoist locomotive crane, equipped with a one yard clam shell bucket, did the work economically, unloading the sand and the aggregate from the railroad cars at a conveniently placed siding.

The same crane was used in preparing this aggregate for the mixer, the material being placed in overhead bins and drawn forth therefrom in proper proportions as required. This crane proved a first class investment for the reason that its activities were not confined to certain areas but it is also available for many other uses including that of spotting the railroad cars of material.

This material was poured into batch boxes which were made by the Lakewood Engineering Company of Cleveland, Ohio, and the boxes were loaded on Acme trucks which took them to the loading point for the industrial railway. At this point the batch boxes were lifted from the truck and placed on the industrial railway trucks by means of an Ingersoll-Rand trigger type hoist. The power for this hoist was furnished by a No. 40 Schramm air compressor. The batch boxes are lifted high enough to clear the top of the truck and then carried over to the railway track by means of the overhead trestle as shown in the picture. The locomotive pulling the train was furnished by the Burton Engineering & Machinery Company of Cincinnati and is a powerful engine operating with gasoline. This locomotive hauls the train of batch boxes to the job where they are lifted and transferred to the mixer.

The unusual feature of this project undertaken by the Royer-Ferguson Company was the use of auto trucks and the report of the company regarding this feature might be of interest to other contractors who may have similar conditions under which to work. It was demonstrated to the satisfaction of the contractors that the material was hauled at a cost of per ton mile cheaper than on any other contract. In reporting on this feature, the company states:

"We have finished the ten and one-half miles of road leading out of High Point towards Winston-Salem, and we are very glad to advise that the six Acmes we purchased from you finished the job in good shape. We hauled with these trucks approximately 45,000 tons of sand, cement and stone at an average distance of six and one-half miles, or 292,500 ton miles, and the actual repair on the entire six Acmes was $15.00, or in other words, practically nothing.

"We carried 16,000 pounds of pay load each trip and about 2,000 pounds of body load. Every one of our Acmes came off the job in first class condition and we believe they will repeat the same feat with very little expense. We are now using them on the job between High Point and Ashboro. On account of the tremendous pull and the speed of our Acmes, they have hauled about what it would have required twenty trucks of the ordinary kind to have done and it is needless to say we are proud of them and will always use Acmes as long as we can buy this kind, and we want to thank you and your organization for the wonderful co-operation and interest you have shown at all times. We do not believe that material has ever been hauled as cheap per ton mile as was hauled on this job."

The State of North Carolina is relying strongly upon similar methods of road building in carrying out its program for this year. It has under construction about two thousand miles of road at a total cost of about thirty-eight millions of dollars. The state is working under an appropriation of fifty million dollars, only one million of which is supplemented by federal aid. With such interest being displayed in the construction of good roads, North Carolina hopes soon to have highways among the best in the country.

Fifteen ton Brownhoist locomotive crane equipped with one yard clamshell bucket loading material into the feeding bins.

Left—Burton gasoline locomotive furnished by Burton Engineering and Machinery Company, of Cincinnati, getting ready to take load of material to job. The batch boxes were made by the Lakewood Engineering Company. Right—An Ingersoll Rand 1½ ton trigger type hoist, operated by a No. 40 Schramm Air Compressor, takes batch boxes from truck to train. Note the fleet of Acme trucks. They performed rather sensationally on this job.

"Which Knew Not Joseph*"

By Bruce Barton

There was once an advertising man, who was in the employ of a circus. It was his function to precede the circus into various communities, distribute tickets to the editor, put up on the barns pictures of the bearded lady and the man-eating snakes, and finally to get in touch with the proprietor of some store and persuade him to purchase the space on either side of the elephant for his advertisement in the parade.

Coming one day to a crossroads town, our friend found that there was only one store. The proprietor did not receive him enthusiastically. Why should I advertise?" he demanded. "I have been here for twenty years. There isn't a man, woman, or child around these parts that doesn't know where I am and what I sell." The advertising man answered very promptly, and he said to the proprietor, pointing across the street, "What is that building over there?" The proprietor answered, "That is the Methodist Episcopal Church." The advertising man said, "How long has that been there?" The proprietor said, "Oh, I don't know; seventy-five years probably." *"And yet,"* exclaimed the advertising man, *"they ring the church bell every Sunday morning."*

My second story has also a religious flavor. It relates to a gentleman named Joseph, who is now deceased.

Those who were brought up on the Bible may have found there some account of his very remarkable business career. Those who have not read that book may have heard of Joseph through the works of Rudyard Kipling. Said Mr. Kipling:

"Who shall doubt the secret hid
Under Cheops' pyramid
Was that the contractor did
Cheops out of several millions
And that Joseph's sudden rise
To comptroller of supplies
Was a graft of monstrous size
Worked on Pharoah's swat civilians."

The account of Joseph in the Old Testament is much more complete and to his credit. It tells how he left his country under difficulties and, coming into a strange country, he rose, through his diligence, to become the principal person in the state, second only to the King. Now, the Biblical narrative brings us to that point—the point where Joseph had public relations with all the other ancient nations, while his private relations held all the best paying jobs—it brings us up to the climax of his career and then it hands us an awful jolt. Without any words of preparation or explanation, it says bluntly:

> "And Pharoah died, and there arose a new King in Egypt which knew not Joseph."

I submit that that is one of the most staggering lines which has ever been written in a business biography. Here was a man so famous that everybody knew him and *presto,* a few people die, a few new ones are born, and *nobody* knows him. The tide of human life has moved on; the king who exalted the friends of Joseph is followed by a king who makes them slaves; all the advertising that the name "Joseph" had enjoyed in one generation is futile and of no avail, *because that generation has gone.*

Now, what has all that to do with us? Very much, indeed. Before you will have finished reading *"four-eighteen"* there will, throughout this country, have passed on to their reward several thousand old men. A rather indelicate reference, perhaps, but a fact, and one we should face.

On these old men we business men collectively have spent a considerable amount of time and a considerable amount of money. It is to be supposed that we have made some impression upon them regarding our service and our purposes and our necessities. But in this interval, while we have been sitting here reading, those old men have died and all our time and all our money and whatever we have built up in the way of good-will in their minds—*all* our labor and investment have passed out with them.

In the same brief interval, there have been born in this country several thousand lusty boys and girls to whom we business men mean no more than the Einstein theory. They do not know the difference between a Mazda lamp and a stick of Wrigley's chewing gum. Nobody has ever told them that Ivory Soap floats or that children cry for Castoria, or what sort of soap to use to have a skin that people would like to touch. The whole job of giving them the information they are going to need in order to form an intelligent public opinion and to exercise an intelligent influence in the community has to be started from the beginning and done over again.

So the first very simple thing that I believe should be so obvious to all of us that this business of public relations is a very constant business, that the fact that we told our story yesterday should not lead us into the delusion of supposing that we have ever told it. There is probably no fact in the United States that is easier to impress upon people's minds than that Ivory Soap floats, and yet the manufacturers of Ivory Soap think it not inconsistent or wasteful to spend more than a million dollars a year in repeating that truth over and over again.

Cultivating good-will is a day-by-day and hour-by-hour business. Every day and every hour the "king" dies and there arises a new "king" to whom we and all our works mean absolutely nothing.

Now, the second very simple thing which I might say is that in our dealings with the public, in what we write and say, we have to be genuine.

And the third very simple thing is this: In dealing with the public the great thing is to deal with them simply, briefly, and in language that they can understand.

Two men delivered speeches about sixty years ago at Gettysburg. One man was the greatest orator of his day, and he spoke for two hours and a half, and probably none of my readers can remember a single word that he said. The other man spoke for considerably less than five minutes, and every school child has at some time learned Lincoln's Gettysburg Address, and remembers it more or less all his life. Many prayers have been uttered in the world — many long, fine-sounding prayers—but the only prayer that any large majority of people have ever learned is the Lord's Prayer, and it is less than two hundred words long. The same thing is true of the Twenty-third Psalm, and there is hardly a Latin word in it. They are short, simple, easily understood words.

I was in Europe this spring, and I rode a great deal in taxicabs. In England I sat in a taxicab and watched the little clock go around in terms of shillings. Then I flew over to Amsterdam and watched it go around in terms of guilders. Then I went down to Brussels and it went around in terms of francs. Then I went to France and it went around in terms of francs of a different value.

I would sit there trying to divide fifteen into one hundred and multiply it by seven, and wonder just where I was getting off, and I have no doubt now that really I was transported in Europe at a very reasonable cost, but because those meters talked to me in terms that were unfamiliar I never stepped out of a taxicab without having a haunting suspicion that probably I had been "gypped."

In a degree some business men suffer like those taxicab men. They come to Mrs. Barton and say, "Buy this washing machine and it will do your washing for just a few cents an hour." She says, "Isn't that wonderful!" She buys it, and at the end of the month she sits with a bill in her hands and she says, "We have run this five hours, and that will probably be so and so." Then she opens the bill and finds that she has not run it five hours; that she has run it 41 kw. and 11 amp. and 32 volts, and that the amount is not so-and-so, but it is $2.67.

That is a matter which I suppose will eventually be straightened out. It should be.

Asking an advertising man to write about advertising is a good deal like asking a doctor to talk about health. What they say is always about the same. The eminent physician says, "Drink plenty of water. Stay outdoors as much as you can. Eat good food. Don't worry. Get eight hours sleep. And if you have anything the matter with you, call a doctor."

So I say that there is a certain technique about this matter of dealing with the public, and if a business has a sales complex that is seriously worrying it officials—whether it be a big advertising problem or merely a bad letterhead (and some concerns have wretched letterheads)—there probably is some advertising doctor in your town who has made a business of the thing, and it may be worth your while to call him in.

In the meantime, and all the time, "be genuine, be simple, be brief; talk to the people in language that they understand, and finally, and most of all, be persistent." We can't expect to advertise in flush times and live on the memory of it when we are hard up. We can't expect to advertise when we are in trouble, or about to be in trouble, and expect to get anything in that direction. It is a day-by-day and hour-by-hour business. If the money that has been thrown away by people who advertised spasmodically was all gathered together it would found and endow the most wonderful home for aged advertising men and their widows in the world. Don't throw any more of that money away. If advertising is worth doing at all, it is worth doing all the time. For every day, the "king" dies, and there arises a new "king" who knows not Joseph.

*From Blakely's "four-eighteen."

Home Made Dump Body

We show with this illustration a home made dump body on a Rumely truck chassis built by John Griffin of Eau Claire, Michigan, who may be seen standing in front of the truck. The body cost Mr. Griffin but $100.00 to build, exclusive of the power and take off, and the job has given entire satisfaction and has proved in no way inferior to factory built pump bodies. The hoist is a single drum and cable proposition, effectively and easily doing the work.

The Connecticut Blower Corporation, Hartford, Conn., has been incorporated under the laws of Delaware with capital of $250,000, M. E. Keeney, president; C. H. Keeney, treasurer; C. E. Keeney, secretary. It has taken over the International Blower Company and the Hartford Sheet Metal Works. The products manufactured and installed are of a large variety, such as blowers and exhaust fans, blower systems of all kinds, dust collecting systems, exhaust systems, ventilating systems, etc. The plant of the International Blower Company will be utilized until fall at which time a considerably larger plant will be occupied.

Railroads of the United States in 1922 had a bill of supplies for current operations of $1,668,000,000, according to figures compiled by the bureau of railway economies. The same record shows that they used 27.8 per cent of the total supply of soft coal, 12 to 15 per cent of the steel output, 30 per cent of equipment companies production, 17½ per cent of all lumber cut and, indirectly, 25 per cent of the total lumber production. Besides these, 10 per cent of the copper and brass output and more than 5 per cent of cement manufactured was sold to the carriers. All of which is substantial backing for the carriers' claim that they are the largest buyers of the nation.

The Orton & Steinbrenner Co., 608 S. Dearborn St., Chicago, Ill., manufacturers of locomotive cranes, buckets and coal crushers have just completed a large addition to their works at Huntington, Ind.

This new addition will approximately double the output of the company. Although it has been only a few years since the original plant was doubled, sales had grown to such an extent that the increased capacity became imperative. All equipment, including a large number of the most modern machine tools, has been purchased and most of it is already in use.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Cement and Engineering News, published monthly at Chicago, Illinois, for October 1, 1923.

State of Illinois,
County of Cook—ss.

Before me, a notary public, in and for the state and county aforesaid, personally appeared David Williams, who, having been duly sworn according to law, deposes and says that he is the editor of the Cement and Engineering News, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Estate of Wm. Seafert, 22 Quincy St., Chicago.

Editor, David Williams, 22 Quincy St., Chicago.

Managing editor, none.

Business manager, David Williams, 22 Quincy St., Chicago.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Estate of Wm. Seafert, 22 Quincy St., Chicago.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is..... (This information is required from daily publications only.)

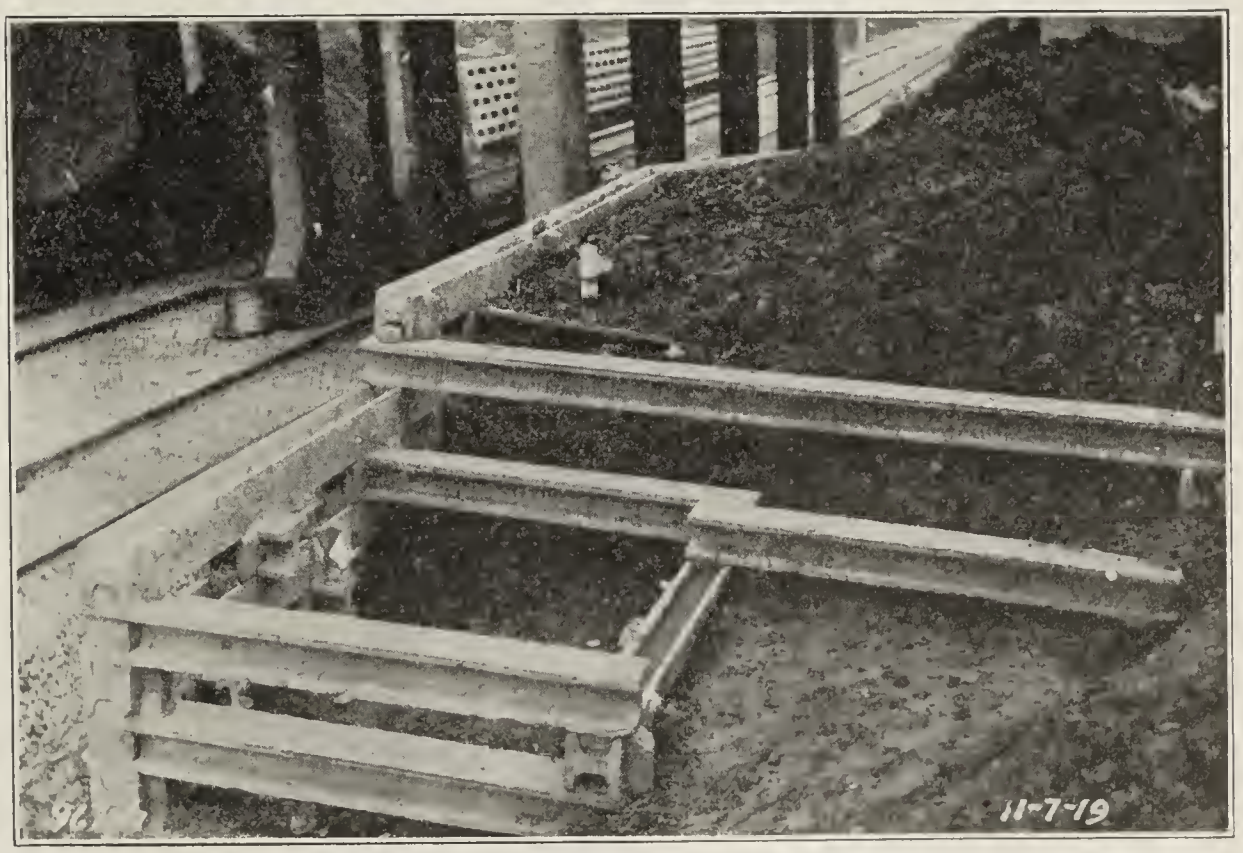
DAVID WILLIAMS,
Cement & Engineering News,
Room 514-515, 22 Quincy St., Chicago.

Sworn to and subscribed before me this 29th day of September, 1923.

(Seal) JULIE V. BAHR.
(My commission expires Aug. 17, 1927.)

A Successful Type of Concrete Cribbing

One of the most interesting types of the precast concrete cribbing is shown in accompanying illustrations. This cribbing is in extensive use on the Cleveland & Youngstown Railway and was manufactured by the Reinforced Concrete Products Company of Cleveland. These views were received through the courtesy of W. E. Pease, Chief Engineer of the Cleveland & Youngstown Railway.



The cribbing consists of a system of reinforced concrete members well shown in the detail picture. Retaining walls built in this way offer a number of advantages. The cribbing may be quickly assembled in place, an important advantage where frequent fast traffic on adjacent tracks must be maintained uninterruptedly; this advantage is equally important in taking care of sudden slides and for other emergency uses. No foundation and no forms are required, so the cribbed wall may be assembled without the need of any more space during construction than the completed wall will occupy.

No excavation is required to start the cribbing, and where it can be used it represents a saving of one-half the cost of solid construction.

New Publications

William Ganschow, president of the William Ganschow Company, is editing a new Hand-Book on Gears and Speed Transformers, which will be combined with the forthcoming Ganschow general catalog No. 100. The purpose of the hand-book is to afford the user of gears and speed transformers easy access to formulae and data regarding their design and use. It contains much data that is usually found only in general engineering hand-books, and will, undoubtedly, be welcomed by users of this sort of equipment as a ready reference volume. The book is to be distributed gratis to all who use such materials as are made by the William Ganschow Company. It will be sent to manufacturing executives upon request to the company at 1001 W. Washington Blvd., Chicago, Ill.

Bulletin No. 309, of the Marion Steam Shovel Company, Marion, O., describes the Marion model 21 electric and gasoline-electric ¾ yard revolving shovels and cranes.

The Handy Sack Baler Company, of Cedar Rapids, Ia., has issued a new leaflet, "Save," which describes the economy resulting from the use of its sack cleaning machinery.

"Illustrating an Ideal Conveyor," the new twelve page folder of the Barber-Greene Company, Aurora, Ill., tells of the details, possibilities, and economies of conveyor use.

The Anchor Concrete Machinery Company, Columbus, Ohio, has published "A Message to Concrete Products Men," a convincing folder describing Anchor block and tile making machinery.

The Maroa Manufacturing Company, of Maroa, Ill., has issued its Bulletin No. 26, describing the uses and possibilities of the Eureka brick cleaning machine, a labor saving device of interest primarily to contractors.

Bulletin F-201 of the Bucyrus Company, South Milwaukee, Wis., describes the 20-B Universal shovel and dragline excavator, gasoline operated. Bulletin P-1002, also recently issued, concerns itself with Bucyrus placer dredge machinery.

The Aston Step Wall Company, of Portland, Ore., has issued a comprehensive leaflet describing the Aston step wall system for construction of wharves, retaining walls, and dam walls.

The Hill Clutch Company, of Cleveland, O., has issued a new leaflet giving sidelights on its transmission equipment.

Trade Information Bulletin No. 155, of the Division of Foreign Tariffs, which may be secured from the Superintendent of Documents, Washington, D. C., deals with trade mark protection in Europe. It is a valuable piece of literature for anyone who wishes to guard himself against possible foreign imposters.

"Elasticity and Strength of Materials —Section III," by C. A. P. Turner. The third of a series of five books dealing with this subject. It takes up in detail the theory of torsion in shafting and the double bending of plates. The book involves a detailed mathematical discussion of its subject and carries numerous plates to illustrate its material. It is a valuable piece of work for engineers, especially those concerned with designing problems. May be obtained direct from the author at Minneapolis, Minn., price $5.00. One hundred and twenty pages, cloth bound.

Doswell & Kover, of Fort Wayne, Ind., have recently issued a booklet entitled "Establish a Business of Your Own," in which the possibilities of a burial vault business are discussed and illustrated. The booklet is complete in that it tells exactly how the vaults are made by their process and adds testimonials as to others' success.

The Conveyors Corporation of America, with offices in Chicago, has published a leaflet depicting its air-tight non-warping furnace door. This may be used in boiler settings, dryers, retorts, kilns, and in quite a few other places.

"Handy Reference Tables," giving details of concrete mixes for various types of work, have been included in an advertising leaflet of the Edison Portland Cement Company.

Hammer Crushers for cement rock and limestone form the basis of the new bulletin No. 1005 of the Pennsylvania Crusher Company, Stephen Girard Bldg., Philadelphia, Pa. The booklet, in its sixteen pages, describes accurately the various types of machines put out by this company. Unusually good photographs illuminate the pages.

The W. A. Jones Foundry and Machine Company, of Chicago, has issued two new catalogues. Number 27, dealing with the subject of pulleys, is full of new and valuable information on cast iron pulleys, Number 28, consisting of 56 pages, deals with Lemley friction clutches, sleeve clutches, cut-off couplings, clutch pulleys, ball bearing clutch pulleys, gas engine clutch pulleys, etc. Full price lists, dimensions, and illustrations are given in each case.

The Diamond Chain & Mfg. Co., of Indianapolis, has issued two booklets of more than usual value. Catalogue B deals with power transmission chains and sprockets, illustrating the various types and giving full handy tables. The booklet entitled "Tables, Charts, and Formulæ," compiled for engineers and designers as an aid in the proper selection of chains, sprockets, and sprocket cutters, is full of information. It is, moreover, made of convenient size and punched to fit the ordinary pocket size loose leaf notebook. Copies of each may be received upon request.

"Kennedy Products," is the name of the new seventh edition of the general catalogue of the Kennedy-Van Saun Mfg. and Eng. Corp., 50 Church Street, N. Y., makers of heavy machinery for the cement industry. The book, about 158 pages in length, is unusually attractive, being printed on glazed paper and carrying an attractive cover. The catalogue lists all machinery in handy reference order, giving full dimensions and possibilities for each type.

Trade Information Bulletin No. 145 of the Bureau of Foreign and Domestic Commerce contains valuable information on the shipment of samples and advertising matter to Europe. A consideration of the contents of this bulletin will help the exporter materially in averting any dissatisfaction on the part of the foreign buyer.

A. S. T M. Tentative Standards for 1923—A new book of eight hundred and sixty pages, giving one hundred and seventy tentative standards. Twenty-eight of them relate to cement, lime, gypsum, and clay products and thirty-eight to road materials. In the main, the classifications run about the same as they did in previous issues. but contain the revisions, additions, and corrections recently authorized by the Society. The term "tentative" has been used to describe the standards so that further criticisms may be elicited. The book may be obtained from the Secretary of the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa., $7 if bound in paper and $8 bound in cloth.

Catalogue No. 46 of the Webster Manufacturing Company, 4500-4560 Cortland St., Chicago, describes chain and sprocket equipment for elevating, conveying and power transmission work.

The Loomis Machine Company, of Tiffin, Ohio, has issued a new general catalogue, illustrating and giving specifications for all types of drills. The book, both interesting and valuable, may be secured by applying directly to the company.

The National Steel Fabric Company, Pittsburgh, Pa., has issued a 32-page booklet describing its products. It not only illustrates and lists the various items, but also gives valuable engineering data.

Advertising is not always effective, so that particularly in connection with work in foreign countries care should be exercised to make sure that advertising efforts shall really be worth while. In a number of countries duties are imposed on catalogues and it frequently works out that if an American manufacturer seeking to cultivate trade with business men there, sends a catalogue in a manner customary to this country, the party addressed will find it necessary to undertake all of the work necessary in connection with a large consignment in order to pass this catalogue through the customs. In addition to the expense involved in the duty actually paid, there is also a fee for the custom house broker and possibly others. It can easily happen that a catalogue may cost the party addressed $5 or more. Obviously this will not put the prospective customer in a very satisfactory frame of mind. In order to assist the American business man in the handling of his foreign advertising campaigns the Foreign Tariffs Division of the Bureau of Foreign and Domestic Commerce has in course of preparation a series of bulletins showing in details the restrictions in each of the sections of the world. The first of this series is trade information bulletin No. 122 entitled "Shipment of Samples and Advertising Matter to the British Empire," copies of which may be secured by addressing the above mentioned division at Washington.

Illustrated Bulletin No. 236, of the Osgood Company, Marion, Ohio, covers the new Osgood 1¼ yard heavy duty steam shovel recently brought out by that company. The new machine embodies the most advanced features of modern steam shovel construction, according to the booklet.

The Stoker Manufacturers Association, with headquarters in Philadelphia, has taken up the subject of getting the most heat at the lowest cost in its attractive booklet, "Coal, the Basic Fuel."

Here and There In the Industry

Charles B. Herring, sales manager of the Ottawa Silica Company, Ottawa, Ill., died October 7, at Pasadena, Calif., where he and his wife had gone two weeks previously with the intention of spending the winter months. His death was caused by heart trouble. Mr. Herring was born in Mechanicsburg, Pa., Dec. 28, 1868, and became associated with the Ottawa Silica Company in 1900. Due to his unusual personality, he enjoyed a large friendship among the trade, and his death will be a great shock to his host of friends. Mr. Herring was a member of the various Masonic bodies,—Ottawa Boat Club, and Ottawa Golf Club.

John H. Jones, president of the Bertha-Consumers Company, of Pittsburgh, Pa., accompanied by his son, Marshall J. H. Jones, chairman of the Mines Committee, recently spent a week visiting the Elsie Mines of the company in the Hazard No. 4 District of Kentucky. The Bertha-Consumers Company has just placed three hundred new fifty-five ton, two-door steel hopper railroad cars at its Elsie Mines, Elsiecoal, Ky., on the Louisville & Nashville Railroad. New shaker screen equipment has been installed at these mines and a number of new houses have been completed to take care of an enlarged working personnel.

W. W. Nichols, of New York, president of the Allis-Chalmers Mfg. Company, was recently elected president of the American Manufacturers' Export Association at its fourteenth annual convention.

Truscon Steel Company, of Youngstown, Ohio, according to Julius Kahn, president, has announced that a new extension will be completed next spring and that the output will thereby be materially increased.

Elliott B. Field, formerly of Detroit, has been appointed advertising and publicity manager for the Kissel Motor Car Company, of Hartford, Wis., according to a recent announcement by that company.

The Blaw-Knox Company of Pittsburgh announces the opening of a Buffalo, N. Y. office at 622 Genesee Building.

J. C. McQuide has been transferred from the Pittsburgh organization as manager of the Buffalo office.

The Buffalo office will now serve northern and western New York and adjacent territory and is in position to give immediate and direct service in connection with the well-known Blaw-Knox products.

The Mid-City Engineering Corporation has recently been organized with offices at 104 N. Franklin St., Chicago, Ill., for the handling of the following classes of work: Bridges, caissons, dams docks, drainage, excavations, foundations, grading, pile driving, retaining walls, sewers, subways, track work, tunnels, and waterworks J. J. Teal is president.

In order to enhance its attractiveness, Santa Barbara, Calif., has announced a small house design competition. Prizes vary from $500 in cash to "honorable mention."

H .A. Reninger of the Lehigh Portland Cement Company, Allentown, Pa., is a member of the executive committee of the National Safety Council for the year 1923-1924. L. A. De Blois, of the E. I. du Pont de Nemours & Co., is president.

The National Highway Traffic Association, North Central Division, will hold a joint meeting with the Michigan State Good Roads Association in the Auditorium of Michigan Agricultural College, East Lansing, Mich., on November 6th. Several widely known speakers will discuss various phases of road building and road necessities.

E. S. Tompkins formerly New York manager for the Mine and Smelter Supply Company is now connected with the sales engineering department of the Kennedy-Van Saun Manufacturing and Engineering Corp., 50 Church Street, New York City.

The University of Michigan, Ann Arbor, has announced its schedule of graduate short period courses in Highway Engineering and Highway Transport, the first of which will take place from December 3rd to 14th, inclusive. Others are scheduled for intervals extending through the middle of March. The popularity of these courses is evidenced by the steady growth in attendance during the past four years. In 1919-1920 29 men enrolled, while last year 110 were in attendance. Their ages varied from 23 to 56 years, and they came from varied enterprises interested in the construction of good roads. A full announcement of the courses may be obtained from Professor Arthur H. Blanchard, of the Civil Engineering Faculty of the University.

The Salt Lake City office of the Sullivan Machinery Company, Mr. B. B. Brewster, Manager, was moved during October from the old location in the Walker Bank Building to new quarters in the Dooly Block, 117-119 West Second South Street. This office serves Utah,

G. G. Kingsbury, advertising manager of the Thew School Company, Lorain, O., has resigned to join the sales department of the Northwest Engineering Company, Chicago, manufacturers of power shovels.

WASHINGTON, Oct. 28.—The monthly report of the U. S. Employment Service of the Department of Labor relative to industrial conditions comments on a continuation of building activity.

"There were no signs of the much-heralded slump in building activity which was anticipated for the fall months, and building construction is maintaining a steady pace in practically all the larger cities of the country," says the report, which deals with the month of September. "In some sections already large construction programs were considerably augmented during the past month by the letting of new contracts, and there is every indication that all tradesmen and closely allied mechanics are assured of steady employment for some time to come. Continuation of state road construction work throughout the country affords employment to tremendous numbers of semi-skilled and common labor, and very little unemployment is reported in any district."

The Pacific-Portland Cement Company has started construction on a new 4,000-barrel cement mill at Redwood City, Calif.

The state of Arizona is considering a cement mill with the dual purpose of lowering road costs and putting to useful work its state prisoners. No definite action has, however, been taken to date.

The Mammoth Plaster and Cement Company was recently organized in Cedar City, Utah, for the purpose of developing a cement mill and a gypsum products business in that vicinity. Vast deposits of raw material are available, it is said.

The Shamokin Shope Brick Company was recently formed in Shamokin, Pa., for the manufacture of brick by the Shope process.

The Lawrence Stone & Gravel Company, of Raleigh, N. C., has been incorporated for $100,000.

The Material Handling Advisory Bureau, of which Mr. Harwood Frost is director, has issued a new leaflet describing its service. It is said to provide an advisory and technical consultation service at a moderate service charge and to promote the more extensive use of mechanical handling equipment of all kinds.

The York Automatic Sealing Vault Company, of York, Pa., of which Mr. George Sunday is manager, has started the manufacture of Unit System Septic tanks. The Valley Concrete Products Company, of Saginaw, Mich., have also started in this line of business. Mr. William De Lhorbe, of Oregon, Ill., who manufactures the molds, reports a consistently growing demand for them, reaching out not only throughout the United States but to China, England, Australia, and Argentine.

The new Block Plant Mixer recently marketed by The Ideal Concrete Machinery Co., Cincinnati, O., is attracting more than usual attention.

Among the more important features claimed for this mixer are the following: 6x24 inch clutch pulley—belt won't slip or wear out. 2½ inch steel paddle shaft with double-keyed gears, cast steel paddle arms, designed to stand the load of mixing coarse materials. Bottom dump assures rapid discharge with least amount of labor. Door automatically locks tightly in place when closed; extra heavy drum shell lasts longer. High pressure grease gun lubrication—automobile type. All bearings outside of drum and protected from sand and gravel. Maximum capacity, ten cubic feet of loose material. Plenty of overload capacity for average block plant equipment. Also made in 14 ft. size, if required.

The Link-Belt Company, of Chicago, has purchased the Meese & Gottfried Co., of San Francisco, Los Angeles, Seattle, and Portland. This acquisition will greatly enhance Link-Belt distributive facilities in the west. B. A. Gayman, formerly treasurer of the Link-Belt Company, heads the new company, known as the Link-Belt Meese & Gottfried Company, while R. W. Yerkes, formerly general manager, has been appointed the new treasurer.

The Japanese Situation

(Continued from page 29)

dustrial Bank is aiding the rehabilitation of factories, while the Hypothetic Bank is assisting other establishment through mortgage loans. The Yokohama Specie Bank is placing credits against twenty-five per cent cash security. It has been decided by the government to compensate the Bank of Japan for all losses involved in rediscounting bills, and the time of rediscounting has been extended to two years.

"During the week ended October 14 ready money was very plentiful. Bankers had more money than could be disposed of and call money consequently showed a downward tendency. The money market is reported to be quiet but firm, and any but influential firms are finding it difficult to negotiate loans. Large American and Japanese firms are having no difficulty in securing their regular line of credit. The usual discount rate is one-eighth of one per cent. Foreign exchange remains steady and it is probable that specie held abroad will be used if any weakness develops."

Indiana Tile Plant

(Continued from page 40)

one ever goes wrong the firm can immediately tell who made it and can trace the difficulty. As an added incentive to good workmanship, the breaking of loads of tile made by the various tile makers are posted each week, the one with the lowest record inevitably being spurred on to more careful workmanship by the comments of his fellow workmen.

This company has recently supplied and erected roofs for the three new Ford Motor plants at Hegewisch, Ill., Ford City, Ontario, and New Orleans, the Nash Motor plant, the Buick plant at Flint, Mich., the Studebaker plant at South Bend, Ind., the Michigan State Fair Coliseum, the Griffin Wheel Company plant at Council Bluffs, Ia., the Maxwell Motor factory at Detroit, and the largest airplane hangar in the United States, located at Scot Field, Belleville, Ill. The success of Federal projects coupled with the general good feeling and efficiency around the plant lead one to believe that this represents an unusually successful organization.

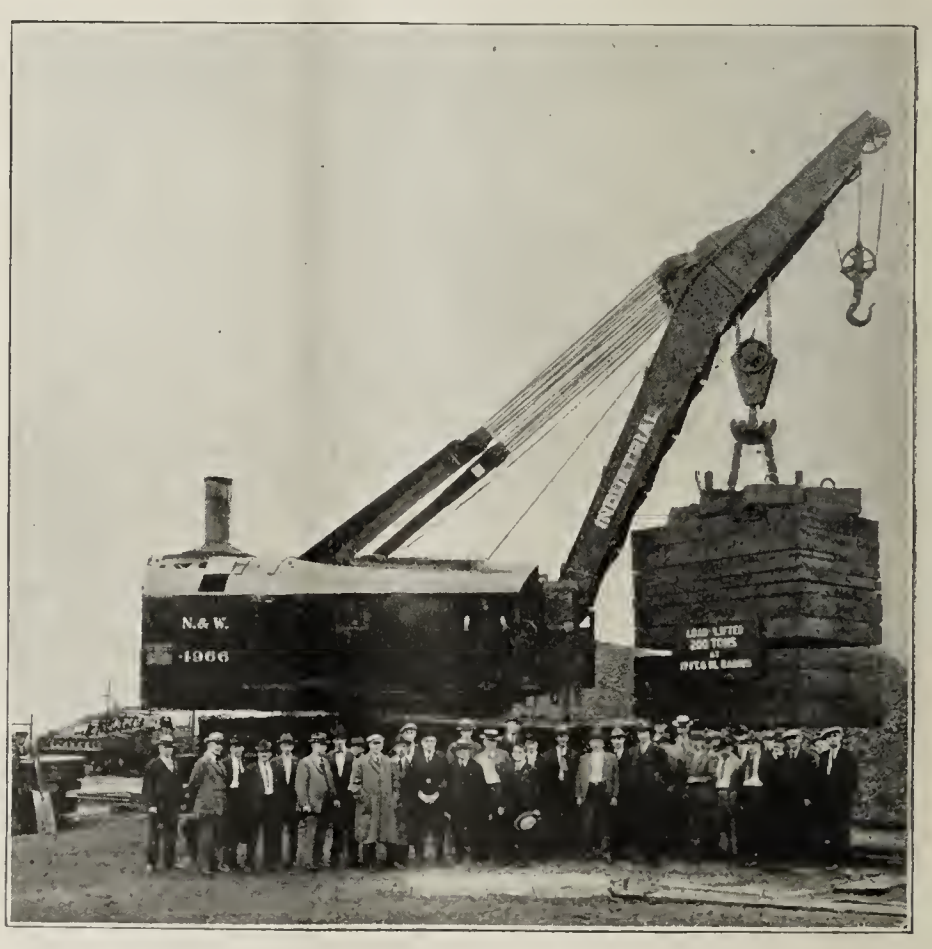
Hydrated Lime

(Continued from page 31)

& Sons, Unit Construction Company, Bacon & Tislow, Roberts & Schaefer, Chicago Bascule Bridge Company, together with the engineering departments of cities like Chicago, Boston, St. Louis, Cincinnati, Kansas City, etc., and highway departments whose roads are as famous as those of Delaware and Massachusetts would hardly continue to use hydrated lime in practically all of their concrete work unless they were firmly convinced of its merit. Hydrated lime is being used in the concrete at the Muscle Shoals dam and was added to the concrete used in the mammoth dirigible hangar at Lakehurst, N. J. A list of the satisfied users would be like a directory of the best engineering, architectural and contracting talent in the country, and examples of their work are countless. It is sufficient to say that all those who have used hydrated lime in the field are because of its success, of the opinion that: "Hydrated lime makes good concrete better."

Governor Sprague Bridge, Rhode Island State Highway Department. A typical example of bridge work when hydrated lime is added to the concrete.

1873



1923

Fifty years' development in Industrial Cranes. Left, the artist's concepion of the first crane. Right, a photo of the largest ever built, lifting over 200 tons. The men standing in front are sales representatives called in from all over the world to attend the 50th anniversary of the Industrial Works, at the plant, Bay City, Michigan.

Cement and Engineering News

Vol. 35 CHICAGO, DECEMBER, 1923 No 12.

Portland Cement Association Meets

Exceptional Progress of Industry During Past Year Reviewed — Officers Elected

The twenty-first annual meeting of the Portland Cement Association was held at the Biltmore, New York, November 19 to 21, inclusive. As usual, the first day's session was devoted to meetings of standing committees covering such subjects as Accident Prevention and Insurance, Advertising and Publicity, Conservation, Technical Problems, etc., resulting in the preparation of annual reports which were presented at the business session on Wednesday, November 21.

On Tuesday, also following several years' custom, the general session was devoted to a discussion of problems concerning mill practice or things related thereto. At this session papers were presented by Paul C. Van Zandt, chief engineer, Asano Portland Cement Co., 1918-1923, on "The Manufacture of Portland Cement in Japan" and by T. H. Cosford, assistant to general manager, Marquette Cement Manufacturing Co., on "Modern Cement Storages and Improvements in Methods of Loading and Packing and Bag Handling."

The annual election of officers was held on Wednesday, November 21, with the following results: F. W. Kelley, Albany, N. Y., president; Blaine S. Smith, Chicago, first vice-president; L. R. Burch, second vice-president, all of these constituting re-elected officers.

John W. Boardman, Detroit, was elected treasurer.

As most of our readers know, the Portland Cement Association has been carrying on for the past two years or more an educational advertising campaign, particularly directed toward acquainting the public with a better understanding of some of the problems of cement manufacture. As is too often true in connection with sizable industries, the general public loses sight of its inter-relation with, and inter-dependence upon any and all industry. It was the consensus of opinion, expressed at the meeting, that this campaign has produced most gratifying results and has justified a continuance.

Unfortunately, early press notices contained the incorrect information that the proposed advertising expenditure for 1924 involved an outlay of $5,000,000. This is so wide of the mark as to be almost ridiculous to anyone at all familiar with even what are commonly called huge advertising appropriations. The fact of the matter is that the Portland Cement Association contemplates no such expenditure but rather gave approval to essentially the same program for 1924 as has been carried on during the present year.

On October 5 the Portland Cement Association delegated H. M. Hadley, a well-known structural engineer of Seattle, Wash., and for many years prominent in connection with construction work on the Pacific coast to visit Japan, making a study and report on the effect of the earthquake on the many modern building erected in Japan within recent years. Mr. Hadley has not had time to make any more than a brief cabled preliminary report, which however,

F. W. Kelley, Re-elected President

seems to indicate that modern reinforced concrete structures in the earthquake zone gave a good account of themselves, and that concete will be used more largely than ever in the great rebuilding plan in Japan which is already under way.

Especially interesting is the report concerning the wireless tower of the Imperial Japanese government, over which the only messages from Tokyo to the outside world were transmitted for some time after the catastrophe. The tower, built of reinforced concrete, is the highest masonry structure in the world. It stands 660 feet above the ground level and 672 feet above the bottom of the footings. The structure was erected by the Weber Chimney Company for the Japanese government in 1921.

According to the letter to Mr. Woodworth, vice-president, all of the concrete chimneys built by the company in Tokyo survived the earthquake. There were between 100 and 150 of these concrete chimneys built by the Weber Company within the earthquake zone. All of these masonry structures were especially constructed to withstand earthquakes, according to Mr. Woodworth.

Attention of the members was called to the latest report on the cement industry by the United States Geological Survey, which showed 1923 to be the banner year for cement production and shipment in the United States. The report, covering the first ten months of the year, showed that cement mills of the country shipped nearly 119,000,000 barrels of cement during that period, with considerable reserve producing capacity not used.

A party comprising leaders of the cement manufacturing industry of England, Norway and Denmark, who visited various cities throughout the United States for two weeks prior to the meeting of the Portland Cement Association, inspecting American concrete roads and studying American methods of using concrete in construction with a view to using the information gained in developing the cement industry in their own countries, were guests at the banquet at the Biltmore on November 21.

During its trip in this country the party has visited Chicago, the steel mills at Gary, Ind., the plant of the Ford Motor Company at Detroit, where they were the personal guests of Henry Ford, Independence Hall in Philadelphia, and Washington. In Washington they were shown the "Home, Sweet Home" house, sponsored by the General Federation of Women's Clubs and dedicated by the late President Harding. The house is built of concrete, and is modeled after the home of John Howard Payne, composer of the famous song.

The party included Percy Malcolm Stewart, A. C. Davis, F. Halford, H. H. D. Anderson, L. Lister-Kaye, E. A. Browne, S G Robinson, A. A. Holter W. H. Lane, Brigadier-General A. E. Critchley and E. R. Moxey, all of England; Paul Larsen of Denmark and H. L. Jackheln of Norway.

How Dependable Are Forecasts?

Human beings are peculiar in that they enjoy gambling but they would always like to know in advance who is going to win. Business is largely a game of chance, and executives have of late taken particular care to forecast probable conditions months in advance so that they may shape their policies to win the greatest gain. Forecasting has, in fact, become a profession in itself, so that experts are selling their services and their bulletins to almost every business enterprise of any importance. How fallible are they? How likely are they to be correct? Upon what do they predicate their prophesies?

Professional Forecasting

Business barometers, or things by which we may sound to some degree the health of business in general, are indeed numerous, but seldom very valuable. Let us consider the things which are commonly taken as fair indicators. Agriculture is perhaps the most important. According to the census of 1910, 12,659,203 persons, or 32.5 per cent of the people in all occupations, were directly engaged in farm work. Farm products are worth in excess of twenty billion dollars each year. In 1914 the total cost of materials used in the manufacturing industries in the United States was $14,368,089,000 of which $7,860,000,000, or about 55 per cent was comprised of products of the farm. It can thus be seen that agriculture plays an important part in industry in general as the prices of raw materials constitute a great portion of the total costs of production. In addition, of course, agricultural activity brings on activity in railroads, for farm products, excluding live stock, contribute one tenth of the revenue freight tonnage of the American roads as a whole, and one fifth of the revenue of western roads. Agricultural activity brings with it incidentally greater purchasing power on the part of those actually engaged in it and its ramifications as well as on the part of railroads and their workers.

Agriculture as a Barometer

Agriculture exerts a tremendous influence on business in general, as the things which its prosperity puts into motion cause good times throughout. Good crops bring about an era of optimism, while poor crops are almost certain to cause depression. Agriculture probably has a greater influence on the business cycle and its potency in either extreme than has any other one thing.

But be that as it may, agriculture is not an infallible barometer. Men cannot forecast crops accurately and therefore cannot prophesy coming agricultural conditions. Crops do not depend entirely on acreage, but rather also upon climatic conditions, things absolutely out of the control of man. The government itself takes exceeding care in attempting to give advance information on crop sizes, but we notice frequent and flagrant errors on its part, errors which cause fluctuations on the stock markets and sometimes bring about artificially depressed or inflated conditions.

As a matter of fact, crops cannot be tabulated accurately until long after they are harvested, as too many uncertainties enter into the forecast. When the figures do approach accuracy they are already too old for use in prognosticating coming conditions. The condition which the bumper crop or the poor crop has inflicted upon us presents itself without being ushered in by accurate prophesy.

Agriculture is not as good a barometer as it is a thermometer. It cannot predict cloudy or sunny days, but at harvest time can give us an indication of the present or immediate heat or frigidity of business conditions in general. Let us bear in mind the fundamental difference between a thermometer and barometer. The latter, being influenced by atmospheric changes, is valuable in predicting in advance the nature of the weather. The thermometer, on the other hand, prophesies nothing. It merely shows the relative atmospheric heat at the time of registration, and its readings can in no way be taken as advance notice of changes. Similarly, a business barometer should predict conditions, while a business thermometer registers only the present comparative business activity. When we are hot, we realize that the mercury column should be high. The thermometer corroborates our belief. A business thermometer similarly is useful only in confirming our opinion as to present—and not future—activity.

Iron and Steel Production

Unfilled orders of the United States Steel Corporation, the largest producer in its field, are almost invariably used to predict forthcoming conditions. We will admit at the outset that those statistics are reliable and that they are timely. But how valuable are they in predicting conditions? They do, indeed, mislead a great many people who try to interpret them. The demand for steel indicates building activity, to be sure. But, curiously enough, building activity is not always at its peak during most prosperous periods. Often construction assumes its greatest proportions in a time of rejuvenation, the time at which factories and railroads are getting ready for an expected rush. For that reason unfilled orders may easily be used in forecasting an impending period of prosperity, but how far away it is and how great it will be is a matter of uncertainty. We might indeed conceive of a situation in which builders themselves forecasted incorrectly, had ordered great supplies of steel, had begun inflation, and had been incorrect in so doing. In that event a careful survey of unfilled orders would lead to false conclusions. Then too we must remember that iron is used in practically every branch of industry, so that when conditions are good, as well as when conditions approach vigor, demand is great. We do not therefore know from unfilled order reports whether industry is in a state of rejuvenation or a state of prosperity, and neither do we know whether that condition, if it exists, is true or is being manipulated by someone. In either case it might well be said that the production of pig iron or the number of unfilled orders of the Steel Corporation are again thermometers of present activity rather than indicators of what is to come. As a matter of fact, pig iron production figures are more reliable than those of the unfilled orders of the Steel Corporation, as the former embrace the entire field while the latter are those of a competitive concern which gets a varying percentage of the total business, a percentage rarely exceeding fifty per cent.

Some forecasters have sought to survey all of the major fields of production, taking into consideration

everything from coal production to tobacco manufacture, and have compared their figures with those of previous periods. Their results are interesting, but they do not in any way tend to forecast anything. Production in one period of prosperity, of any particular commodity, may be double that in another similar period. If, for instance, we know that a certain amount of cement was manufactured in 1917 and if we know (whether the condition is actually true or not) the output is now greatly in excess of the previous high mark, we cannot say that any individual firm is making more profits, or that industry in general is flourishing to a greater extent. Perhaps more cement mills have been added to take care of the extra demand, and perhaps some major government road building project is now taking a great deal of cement, whereas in the past that material was used in industry itself. In other words, conditions are changing so rapidly that we cannot take present figures in a comparison with those of the past to indicate to us our relative prosperity at any time. So we see that we have figures more interesting than absolutely valuable, and have by no means a basis of accurate forecast.

Comparing Figures

High commodity prices are invariably followed by lower prices and less business activity, but unfortunately prices do not have mixed maxima and minima. The approach of the 1913 high price in a certain commodity today would in no way indicate that business is flourishing, for the low price now may be greater than the high price then. The platitude that "things which go up must come down," is true, but we do not know how high or low they will go, neither do we know the time of flight in either direction. Cycles vary greatly in length, and any attempt to say that because a certain price trend took a certain length of time in the past it will take the same time in the future, is ludicrous. Commodity prices indicate only one thing. They may show the general trend of future business, but they do not submit themselves to accurate timing. We may believe that business will soon be good, but whether that condition will come about a month from now, a year hence, or two years in the future is merely a matter of absolute opinion.

Commodity Prices

Commodity shipments indicate the amount of present business, and idle cars indicate lack of sales. But these things follow rather than precede business activity. Deliveries may not be made for sometime after an order has been placed, so that we cannot say that shipments of goods serve very admirably as oracles predicting future conditions.

Exports do not mean as much as we sometimes think. Manufactured products form a great part of our shipments to foreign countries, but even during periods of greatest exports those shipments never amount to over five per cent of our total output. Exporting is brought about because there does not exist a market in this country. The demand in this country actually slacks, however, before foreign fields are invaded, so that an increase in exports merely confirms a former conviction that business here is dull. It has little barometric value.

Retail sales, which may, in the case of chain stores, be accurately recorded, indicate merely present conditions. Figures on the whole are too incomplete, however, to be of any great value either barometrically or thermometrically.

Wages and labor are often taken as indices. The amount of unemployment cannot be determined satisfactorily, so that we must at once throw that out of consideration. Wages follow the cycle rather than precede it. They always lag behind conditions. As business starts up, the labor market is overcrowded, so that men are willing to work for low wages. Then jobs become more plentiful than men and employers start fighting for them so that they may make goods to fill orders which they already have. Then during the liquidation period costs must be cut, so labor is discharged, and so on. The significant thing is that in each case labor's recompense actually follows market and industrial trends, so that it is not a fair indicator of future conditions. The application of labor saving machinery to supplant men also each year makes the use of labor statistics more undependable.

Unemployment and Wages

Current corporation earnings, or rather net earnings, are usually announced too late to be of any value. Then, too, it must be remembered that they do not always indicate the actual profit or activity, for often money is used for improvements of the plant or the building of a reserve rather than for the declaration of dividends. Such figures possess little if any barometric value.

Business failures in great numbers usually foretell coming depression. Enterprises which have been tottering along on small margins topple with the first waver of the market. The tendency, however, is to attempt to exist despite the discouraging outlook, so that failures actually indicate the presence of depression, otherwise indicated many times, rather than foretelling it.

Bank clearings are not valuable or prognosticating evidence, for they represent past rather than future transactions. Business is not conducted on a cash basis, but rather on long credits, so that a large aggregate of clearings may take place after prosperity has passed and represent merely the settlements for business which has long since passed into oblivion.

Bank Clearings

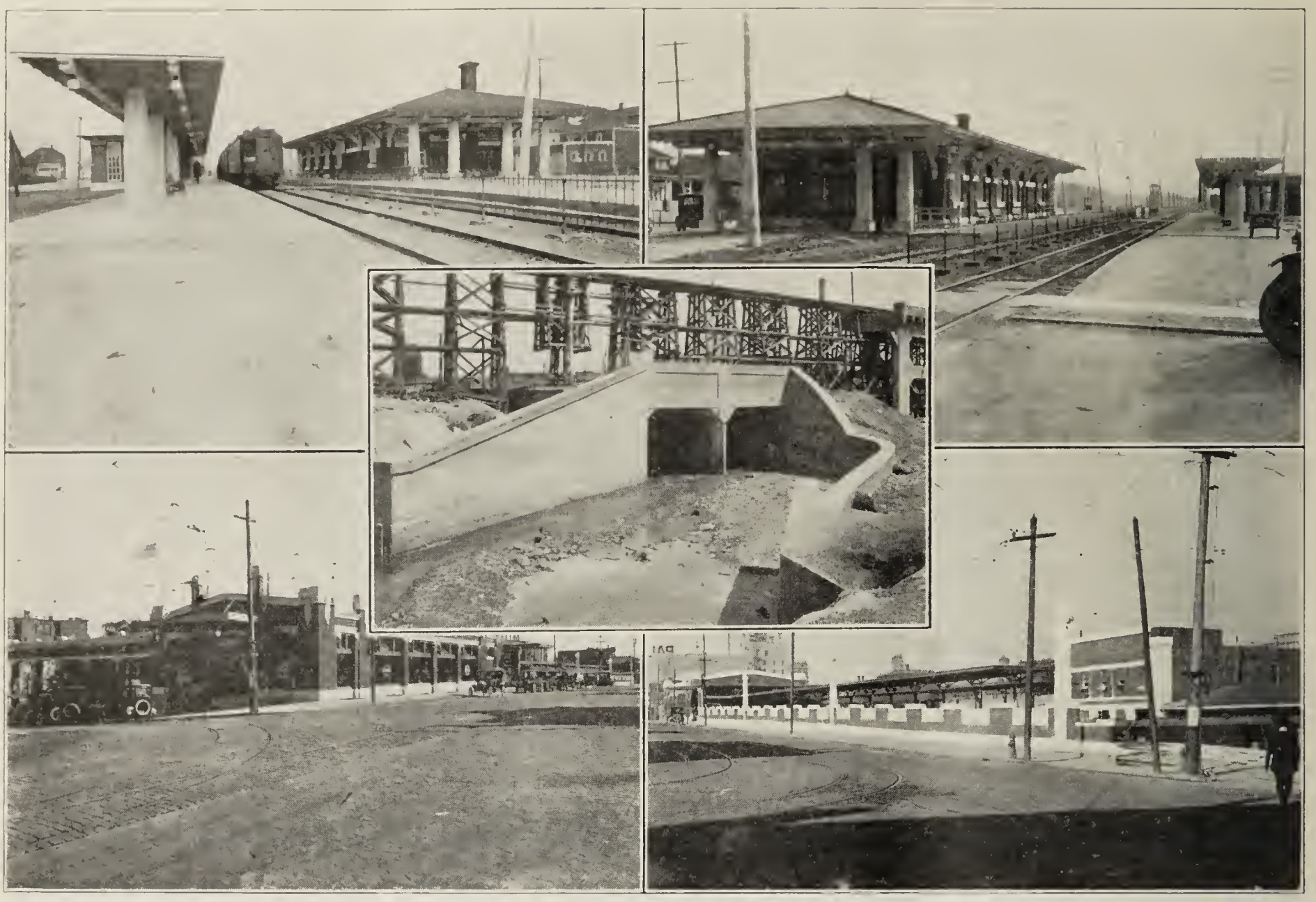
Bank statements and interest rates, especially call interest rates, are fairly good barometers. A large proportion of loans indicate the fact that industrialists are preparing for a period of activity, and high interest rates indicate that loanable funds are becoming scarce. As money must be borrowed in advance of activity to finance actual production, a comparatively high amount of loaned funds indicates in geenral that conditions are to become more prosperous.

New security issues in general foretell conditions. Issues of stock indicate that prosperity is thought by the directors to be in prospect, while bond issues indicate a period of retrenchment. Changing characteristics of securities together with the multiplicity of things for which they may be issued, however, lessen their barometric value.

Security Issues

The volume of business on the stock exchanges and the prices paid for securities are in a way indicators of what is to come, for people who deal in these things play futures almost entirely. When they believe a period of prosperity is approaching, they sell their low fixed interest rate bonds and pay higher prices for common stocks which promise bigger dividends. It is said that the trend of stocks thus foretells fairly accurately business conditions six months in advance. Conversely, when a period of prosperity is drawing

(Continued on page 50)



Upper right—Kenosha station, C. N. S. & M. R. R., showing liberal use of concrete for poles, canopy supports, architectural cast stone and station platforms. Upper left—The "Eastern Limited" which brings travelers for the Twentieth Century Limited from Milwaukee to Chicago in two hours, pausing momentarily at one of the new concrete stations. Lower left —Milwaukee Terminal, C. N. S. & M. R. R., a handsome concrete structure faced with brick and concrete art stone. Lower right—Concrete improvements in the Milwaukee passenger and freight terminals. Center—Substantial reinforced concrete bridge and trestle over the Kinnickinnic River, near Milwaukee, making it possible to abandon wooden trestle for earth pile.

High Speed Railroad Uses Concrete

"For distinguished contribution to the development of electric transportation for the convenience of the public and the benefit of industry" the Chicago, North Shore & Milwaukee railroad has just won the highest award of the Charles A. Coffin foundation, carrying with it a large cash prize and the coveted solid gold medal, looked upon in the electric railway field as the mark of service par excellence. Since concrete is playing an important part in the development of the "North Shore Line," as it is popularly known, to the point where it has become the acknowledged leader, our readers will be interested in a short description of the road and some of the various uses to which concrete has been put along its lines.

The Chicago, North Shore & Milwaukee railroad now is unquestionably the highest speed electrically operated railroad in America. Fast time has required that the road be substantially built in every detail, and it is assuredly setting the pace for other interurban roads in the matter of making permanent improvements. In so doing, it is helping to banish the bugaboo of rising maintenance expense, an important consideration with every railroad and, of course, a particularly serious matter with high speed roads, considering perfect maintenance required to insure safety.

This railroad has some forty trains a day which traverse a distance of over eighty-five miles from Chicago to Milwaukee in two and a half hours, and a few trains covering the distance in two hours and ten minutes, with an average speed, including city travel and stops of forty-two miles per hour. Several miles of slip-proof concrete platforms have been built to reduce accidents and shorten stops, and many platforms have been widened to accommodate baggage and afford greater convenience to the increasing traffic.

Kenosha station, shown in accompanying views, is typical of the new permanent building improvements along the line. The building is entirely of concrete and brick, trimmed in concrete art stone. Columns supporting platform canopies as well as adjacent poles for the support of trolley and transmission wires are of reinforced concrete. No more substantial construction can be found on any railroad in America.

The Milwaukee terminal is an interesting example of modern reinforced concrete structure faced with brown tapestry brick and granite textured concrete art stone. The building houses not only modern waiting room, ticket offices and baggage room but very extensive conveniences, including a splendid restaurant, lunch counter, refreshment stands and travellers' comforts. The interior presents clean, dignified looking concrete surfaces.

Patrons of the road are less familiar with the substantial uses of concrete along the right-of-way, although these have required much more cement and far greater expenditures than the work already described. About a dozen new automatic substations have massive concrete foundations to do away with vibration of the intricate electrical mechanism and make automatic operation of the substations—without human attendants—absolutely reliable.

Interlocking and other signal equipment has been substantially mounted on concrete bases to cut maintenance and insure their dependable operation. Concrete lighting standards have been erected in some locations, retaining walls and curbing put up to protect adjoining property and crossings, and wooden trestling has been entirely eliminated.

An accompanying view indicates the nature of typical improvements, just south of Milwaukee, where the line crosses a deep hollow, a river and two steam railroads. After constructing a reinforced concrete bridge, trestle and extensive retaining walls, the right-of-way across the hollow has been entirely filled and a wide standard ballasted line runs over the top. Former slow orders have been removed, delays eliminated and such sources of worry to nervous passengers have been abolished all along the line.

Japan May Need American Cement

WASHINGTON, Nov. 28.—Organization of a huge building construction company which will specialize in four-story reinforced concrete buildings designed to withstand earthquake shocks is being effected in Tokyo, according to a report to the Far Eastern division of the Department of Commerce. The same report indicates that when permanent building activities are commenced in Japan it may be necessary to import considerable quantities of cement. First reports were that no foreign cement would be needed. Orders for American cement have not materialized thus far, and if there is demand for it, it will not come presumably until definite plans have been formulated for a permanent building program. Thus far the construction which has been commenced has been of a temporary type.

The building construction company which is being organized in Tokyo plans to erect commercial and industrial buildings on the unit basis. The general type of construction will be similar to that used in the reinforced concrete buildings of which a few were erected prior to the recent earthquake and which withstood the effects of that disaster. It is announced that such material as cannot be obtained locally by this new building construction company or which cannot be supplied in standard specifications will be obtained abroad.

"Funds for the promotion of this new company will, according to present plans, be obtained in large part from the government at a low interest rate," says the report received by the Far Eastern division of the Department of Commerce from Tokyo. "At present the company is marking time awaiting the announcement of the plans of the Capital Restoration Board as to the areas set aside for industrial and business purposes, etc.

"The announcement of the general plans for reconstruction as worked out by the Reconstruction Board are expected any day. Meanwhile, temporary construction is in progress in a big way in Tokyo and Yokohama but permanent building is, of course, being delayed until after promulgation of regulations designating industrial and commercial zones, height of buildings, materials to be used, etc.

Will Need Material

"It appears at present that in addition to securing abroad a large part of the iron and steel and lumber that goes into the permanent reconstruction, considerable quantities of cement will have to be imported as well. Ordinarily Japan exports considerable cement, but the enormous demand that is bound to come with the commencement of permanent building activities, coupled with the destruction of about eight per cent of Japan's cement production, will be greater than the industry can meet.

"The annual capacity of Japan's cement mills was, before the earthquake, in the neighborhood of 14,000,000 barrels and plans are under way which will, within six months' time, bring this up to 17,000,000 barrels, notwithstanding the losses suffered by the earthquake. Until such time as this increased output is brought about, it is expected that the domestic supply will be inadequate and that considerable cement will have to be imported. In anticipation of this need, the government has placed cement on the free list, effective until March 31, 1924.

"Conservative bankers in Tokyo are advocating a program of reconstruction spread over a period of twenty years and financed in most part through the flotation of domestic loans. In order to keep the yen on an even keel, however, they favor the flotation of foreign loans sufficient to cover all purchases made abroad."

Speculation Diminishes

A report from Assistant Trade Commissioner Paul P. Steintorf, Kobe, Japan, states that the speculation in reconstruction materials that followed on the heels of the earthquake in Japan has practically ceased. Buyers and importers are now unwilling to proceed until they have definite knowledge as to what the government's plans will be in regard to purchasing and financing private construction requirements.

The lumber market presents a good illustration of this tendency. During the first thirty days following the earthquake offers were placed in America for something like 125,000,000 feet of lumber. Practically all of these orders were speculative, since importers had not secured any contracts for sales to the government, and sales to private dealers in the damaged area were practically impossible. Speculators had in mind disposing of their holdings to the government at a handsome profit, but since no definite reconstruction program has been announced, they are beginning to feel uneasy and consequently no further orders of any importance are being placed.

The iron and steel market is also suffering from lack of definite knowledge of what the government's plans will be. Anticipating a tremendous demand for all kinds of iron and steel construction material, speculation was very heavy during September. At present, however, the demand is falling off, owing to financial difficulties and the destruction of industries using such materials. Galvanized and black sheets for emergency purposes seem to be the only items in demand at present. The Japanese government has closed bids direct from manufacturers in this country. The postponement of permanent reconstruction, pending completion of plans by the reconstruction board, will probably delay developments in this market until well after the first of the year.

Award Contracts

The Japanese embassy, on behalf of the Japanese government, has awarded contracts for 97,150,000 feet of lumber for use in building dwellings in the devastated area in Japan. The lumber is to be used in connection with temporary building construction, the Japanese embassy stating that no definite plan has been evolved by the Japanese board of reconstruction for permanent rebuilding.

Announcement has also been made by the Japanese embassy of an award of contract for 20,000 tons of steel sheets to the United States Steel Products Company, the export subsidiary of the Steel Corporation, and 2,000 tons of wire nails to the Youngstown Sheet & Tube Company, and for 1,000 tons of wire nails to the Pittsburgh Steel Company.

The Department of Commerce is doing everything possible toward aiding American manufacturers in securing orders for commodities needed by Japan. Plans for more concerted action on the part of American manufacturers in supplying the needs of Japan both during the present emergency and as a possible permanent development were discussed at the Department of Commerce at a conference between J. Walter Drake, assistant secretary of commerce, other officials and representatives of various trade associations.

Favor American Goods

"Japanese sentiment is particularly favorable to Americans and American goods at this moment," Mr. Drake declared. "Other nations, aware of this fact, are attempting to capture the market, and it behooves American business men to get closer together if we are to take advantage of the opportunity and at the same time effectively meet the united fronts presented by the merchants and manufacturers of competing countries."

Organization under the provisions of the Webb-Pomerene act, and the possibility of combining one or more non-competitive lines of manufacture in horizontal groups with joint sales organizations in Japan, were the two most important measures mentioned. It was the opinion of the conferees that either or both methods apply to the several industries represented and to other industries as well. The presidents of the associations represented at the conference agreed to present the various suggestions to their memberships and to endeavor to crystallize sentiment in favor of a more "United America for foreign trade." To assist them, the various commodity, regional and technical experts in the Department of Commerce will immediately draw up surveys of the Japanese market as it applies to different lines of American products, including information regarding financing, shipping and related subjects.

The cement industry was not directly represented at the conference at the Department of Commerce. The National Association of Manufacturers was represented by Nathan B. Williams. Other associations represented included those of the shoe manufacturers, drug manufacturers, manufacturing chemists, fertilizer manufacturers and paper manufacturers. Others invited to the conference included hardware manufacturers, plate glass manufacturers and enameled sanitary ware manufacturers.

Study Conditions

An American commission of lumber exporters has sailed for Japan to study Japanese lumber requirements for reconstruction in the earthquake area. The American commission will conduct its survey and negotiations on behalf of more than 100 large export lumber mills in the Pacific coast region. The commission is composed of Major E. G. Griggs, of Tacoma, Wash., president of the Douglas Fir Exploitation and Export Co.; O. M. Clark, of Portland, Ore., leading lumber manufacturer, and Chester J. Hogue, of Seattle, manager of the West Coast Forest Products Bureau.

This group of recognized lumber authorities will visit Tokyo, Yokohama, and other Japanese cities and confer with Japanese commercial interests identified with plans to supply emergency supplies of lumber in large volume, and with the least delay possible, to meet rebuilding needs.

A special effort will be made by the commission to induce Japanese lumber buyers to accept shipments of American standard lumber sizes, which are readily available at American lumber mills. The commission is hopeful some modification of the usual Japanese lumber specifications may be authorized. The commission feels that if this is done it will greatly facilitate the movement of American lumber shipments needed by Japan, and avoid delays in negotiating contracts with American lumber merchants.

Cement Bricks Win Fight with Clay

Adopted in Baltimore After False Rumor of Failure in Cleveland Had Brought About Investigation

Concrete brick is beginning to cut some figure in Baltimore. Some recently organized plants have just begun to swing into production in earnest and as a result, evidences of competitive strife are fast developing. The Adamantex Brick Company, the Arundel Shope Brick Company and other local concrete brick concerns are making themselves felt as pronounced factors in the market and as *Brick and Clay Record* (October 2) says, "Concrete brick and block are here to stay and nothing the clay industry can do will eliminate them from the face of the earth."

Concrete brick made this dwelling both attractive and durable.

The fame of concrete brick and the economy in their use reached the Baltimore School Board. Baltimore is a progressive and rapidly growing city in which the problem of keeping new school construction abreast of current demands is a particularly difficult one. Like most cities, Baltimore faces the necessity of making every dollar go as far as possible.

It was proposed to use concrete brick for a certain new school building. Objection arose, presumably instigated by those who had previously supplied the brick for Baltimore's schools. The Mayor, in order to play fair, appointed an impartial committee to investigate. After the meeting of the committee there appeared in the *Baltimore Sun* and other papers an article stating that at the committee meeting Joseph E. Sperry, architect for the committee and one of the leading Baltimore architects, had made the statement that a school building in Cleveland recently collapsed because it had been built of concrete brick. This story was quickly carried to other cities "suffering" from concrete brick competition.

In order to trace the fanciful story to its source, the Portland Cement Association made a prompt investigation and discovered not only that no school building had ever been built of concrete brick in Cleveland, and that neither Mr. Sperry nor anyone else appearing before the committee ever made the statements reported.

When the matter was drown to the attention of Mr. Sperry, he was quick to reply as follows:

Mr. Sperry Sets Them Right

"Replying to your letter of Sept. 26th, 1923, relating to clippings from the *Evening Sun* of August 23rd and the *Morning Sun* of August 24th, in which I was reported as having stated that the recent collapse of a School Building in Cleveland was due to the fact that it was constructed of Cement Brick, no such statement was made by me or by any one who appeared before the Committee appointed by the Mayor to investigate the construction of The Clifton Park School in Baltimore.

"Reference was made by the Secretary of The Public School Association (not by me) in a letter to the Mayor, of the collapse of a building in Cleveland, but no statement was made of the kind of bricks used, or the purpose for which the building was erected.

"I have a copy of the stenographic report of the four Public Hearings, which can be seen by any one interested in the matter."

If any concrete brick manufacturer finds that the Cleveland school house failure yarn has been introduced in his locality, he may pat himself on the back for having been acknowledged as a worthy contender for business in a field where competing types formerly held a monopoly. He will also be at liberty to reproduce the above letter from Mr. Sperry and the following article from the *Baltimore Sun*. Let no one be deceived. Those who fail to play up the true facts when attacked ought to be condemned almost as much as antag-

Here an apartment was wanted as a lasting investment; Concrete brick were wisely chosen.

onists who depend on misstatements to gain public favor.

Sun's Final Statement

When the truth about the matter reached the *Baltimore Sun* (propagandists should beware trying to hoodwink a red-blooded up-to-the-minute daily), a story appeared in that paper under date of October 8, an extract of which follows:

"CLEVELAND SCHOOL COLLAPSE IS DENIED

"Report Here Held Untrue

"An investigation conducted by the Portland Cement Association into statements quoted by *The Sun* to the effect that a school-building collapse in Cleveland was due to the use of cement brick has disclosed no evidence of the accuracy of these statements.

"On the contrary, the Portland Cement association states flatly that there was no such collapse and that concrete brick has not been used in Cleveland schools. The original statements were attributed to witnesses before the special committee of the Board of Estimates August 23. The association in a letter to *The Sun* also presents the denial of Joseph E. Sperry, architect, that the charge was made at the inquiry into Baltimore school construction."

"All's Well That Ends Well"

The following article which appeared in the *Baltimore Sun* October 30, tells the final chapter of the story ending with the purchase by the Baltimore School Board of two million concrete brick with the market definitely open to many million more. Although it will be noted that the first brick to be used in the Baltimore schools will be only on the interior walls, Baltimore will, no doubt, fall in line with Brooklyn, where for the last two years concrete brick have been used extensively if not exclusively on all of the school buildings, and with some twenty other large cities where concrete brick recently have come into general favor.

"PUBLIC INVESTIGATING COMMITTEE SANCTIONS CHANGE IN BRICK

"Two Million Cement Brick to Be Substituted for Clay

"Substitution of two million cement bricks for clay bricks in the construction of the Colored High School, Carey and Baker Streets, was authorized yesterday by the Public Improvement Commission. It was said that the change would result in a saving to the city of $1,200.

"The action of the Commission followed a request from the Board of Awards earlier in the day that the Mayor's Committee on Economy and Efficiency review the recommendations of a special committee that recently investigated substitutions at the Clifton Park High School. These recommendations, based largely on the substitution of cement bricks for clay bricks at the Clifton Park school, were that architects designing school buildings have control over building operations and that supervision of construction of schools and other municipal buildings be transferred from the Improvement Commission's Bureau of Construction to the Inspector of Buildings.

* * * *

"The investigation of the Clifton Park school followed charges of the substitution of cement bricks for clay bricks and of other substitutions.

* * * *

"Henry D. Harlan, former chief judge of the Supreme Bench of Baltimore, brought up the question of using cement bricks for clay bricks at the Colored High School as the commission was about to adjourn. After a brief discussion he offered a resolution approving the substitution. The resolution was seconded by J. Barry Mahool, former Mayor. Except for the action of Mr. Jackson, the mayor, in asking to be excused the vote was unanimous.

"Henry G. Perring, supervising engineer in charge of the Construction Bureau, told the commission cement bricks could be used in the interior of the walls with entire safety. He said the substitution had first been suggested by J. Henry Miller, the contractor.

"Mr. Perring said the school architects, Owens and Sisco, were non-committal on the question and that cement bricks had been disapproved by Herman F. Doeleman, their engineer. Mr. Doeleman, together with Joseph Evans Sperry, architect, served as special investigators for R. Walter Graham, City Comptroller, and Frederick A. Dolfield, City Registrar, who conducted the Clifton Park school investigation for the Board of Awards.

"Authorities high in the engineering field recently have set their seal of approval on cement bricks, Mr. Perring declared. He said the commission has received letters favoring their use from the United States Bureau of Standards, the testing bureau of the engineers' school of Columbia University, at New York, and the laboratory of the engineering department of Johns Hopkins University. The commission's school committee also had recommended their use, he added.

"It was explained that the cement bricks are to be used only in the inside of the walls. Clay face brick will form the outer surface.

"Before introducing his resolution Mr. Harlan asked Robert Garrett, chairman, for an expression of opinion. The chairman replied that he favored using cement bricks and was ready so to vote. Mayor Jackson asked several questions but made no comment on the substitution plan itself.

"Steuart Purcell, Chief Engineer of Baltimore, said he approved the change provided the cement bricks were tested and found suitable. The cost of these tests is to be shared by the manufacturer and the contractor on the school. It was said there are about 1,500,000 cement bricks now awaiting the tests."

Modern business demands modern materials. Concrete brick were used in building these splendid stores.

Several San Francisco contractors are using portable bunkers for receiving and storing crushed rock and sand for concrete building operations. They are constructed in such a manner that they can be quickly and easily dismantled on one job and set up again on the next. They are placed at such a height that the crushed rock and sand can be delivered to the concrete mixer by gravity. An incline extends from the street to the top of the bunkers and permits the motor trucks to dump the aggregate directly into the bunkers. This equipment practically eliminates congestion in the city streets when motor trucks are unloading sand and gravel.

Cement as a Medium for Artistic Expression

Lorado Taft, the Famous Sculptor, Accomplishes Wonders With a New and Efficient Method of Casting Concrete Statuary

Confronted with the task of translating his model into the largest group of sculpture in the world, consisting of one hundred figures in most intricate formation on a single base, and having classified as unsuitable both bronze and the stones ordinarily used in statuary work, Lorado Taft, now head of the Chicago Art Institute, explored the possibilities of concrete and found it suitable for his work.

He was erecting the now famous "Fountain of Time," which adorns the well-known Midway of Chicago. He had spent six years of effort and $50,000 in cash getting ready for the final statue, but struck an obstacle when the translation of his work into permanent form became necessary. Ordinary methods for such work would mean an additional expenditure of some $250,000, but even at that Mr. Taft could not persuade the only stone cutters with whom he felt he could entrust the task to bid on the job. Then he interviewed John J. Early, of Washington, D. C., who has been able to secure artistic and satisfactory effects through the use of concrete. It was agreed that the attempt should be made to cast the immense "Fountain of Time," despite the fact that the close intermingling of one hundred figures on an unusually big base meant innumerable molding difficulties.

Mr. Earley, in later discussing his hardships, said, in part:

"I frankly admit that the 'Fountain of Time' presented the most difficult problem of its kind that has ever been brought to my studio. Unlike other sculptural groups which are usually composed of separate figures on a common base touching each other only at certain points, this great group presented a wavelike mass from which projected and into which receded nearly one hundred colossal figures."

How these difficulties were overcome and how the group was finally cast are best described in Mr. Earley's own words:

"Concrete as an artistic medium becomes doubly interesting when we realize that in addition to its economy it possesses those properties which are the most desirable of both metal and stone. Metal is cast, it is an exact mechanical reproduction of the artist's work, as is concrete; but metal because of its color and the peculiar quality of its surface is hard to use, that is, it is hard, particularly hard in large subjects, to fit into ordinary surroundings. On the other hand, stone has a color and texture which is easier to adjust to general use and environment, than is concrete, which is largely stone, which partakes of the properties of stone and which when surface treated as was the 'Fountain of Time' has a surface almost entirely of stone; but

The figure of Father Time

stone is an interpretation of an original work and is more often than not quarried out by another than the original artist.

Unusual Requirements

"I will not present to you the usual processes of casting concrete in a plaster mold but will indicate where in the processes employed in casting the 'Fountain of Time' differed from ordinary practice.

A detail of the fountain

"The features of the work which introduced unusual requirements were, first, the shape of the group which was a continuous structure and not a series of assembled units; second, a complex fold which instead of being a receptacle into which the concrete could be poured was a dome under which it must be placed and with which it must be maintained in contact while hardening; third, a core which would generally follow the configuration of the mold at a certain distance from it to regulate the thickness of the concrete and to support it in place, in contact with the mold while setting; and fourth, a concrete which would fill perfectly all the re-entrant angles of a complicated mold, would not change volume and shrink away from the mold while setting, would attain an early strength to permit the removal of the mold and the exposure of the aggregate before final set, and which would, when cleaned, present a surface of predetermined color and texture.

"We were considerably concerned about what to do with water which might collect in hollows among the figures. If we altered the shape of the mass sufficiently to eliminate the hollows we would naturally change the design of the group. But Mr. Taylor, my associate in the studio, solved the problem by resolving the entire structure into the elements of a house; a foundation, a first story, a second story, and a roof. The roof was built as high as possible but yet below a level at which the figures met in a continuous mass. It was pitched towards the center and drained by down spouts. The figures which formed the second story extended above the roof as an irregular parapet. They were arbitrarily divided into twenty-six sections of such size as estimated to contain the amount of concrete which could be placed in a normal day's work by the most efficient number of men. The joinings between sections were always vertical and located in recesses. The first story and the foundations presented no unusual features.

"A cup may well represent a simple mold. A plastic material which has hardened in it and which has been emptied out may be considered a simple cast. Let us imagine that the smooth interior surface of the cup becomes successively more irregular in form and that the cast is emptied out with increasing difficulty until finally it can not be removed. Such a difficulty is met by complicating the mold, by dividing it into a number of pieces each of which is sufficiently simple in form to be removed without difficulty from the cast. Again let us imagine that this complex mold and cast have so increased in size and weight as to prevent turning and emptying. Such a condition would evidently prevent filling the mold as a receptacle and require unusual methods of casting. Such a cast might well be made hollow to economize in materials and to relieve the foundations from unnecessary loading.

Details of the Mold

"The 'Fountain of Time,' with nearly 100 figures in a continuous form 120 feet long, 18 feet high and 14 feet wide, required a mold too large and too complicated to be filled by usual methods and formed a cast too large to be made solid.

"The mold, which was made of plaster of paris heavily reinforced with jute fiber and 2-inch iron pipe, was divided horizontally into 30-inch courses. It was built from bottom to top and from station to station. The bottom course rested upon a timber which was fastened to the base below the feet of the figures in the same position relative to the figures that the top edge of the concrete base would occupy.

The famous group, "The Fountain of Time"

The timber so formed the first course of the mold that it fitted onto the top edge of the concrete base, was kept in alignment and supplied by it. At each station there was a zone the height of the model and one inch wide where the molds lapped. This was done in order that after the first section had been poured each concrete cast would act as a guide for the assembly of the next section of mold and as a bulkhead for one end while a temporary bulkhead close the other. Because the group has 255 feet in girth we thought it wise not to depend altogether for alignment on the top edge of the base and the vertical jigs but to leave three or four narrow sections for closures in which any slight misalignment could be adjusted. We were indeed pleased when we found that the mold for the last pouring lined up with the first casting, without need of adjustment. Nevertheless, were we doing another 'Fountain of Time' we would leave closures and provide for adjustments.

"Two particularly interesting features of the mold were the sections across the top extending from side to side in the form of bridges, which were self-sustaining and which supported the surrounding pieces of mold in a construction similar to the masonry vaults of certain Gothic churches. The other feature was the arrangement of the mold under the figures which projected almost horizontally from the general mass. Before final set had occurred it was necessary to remove these pieces of the mold and to surface the concrete. At the same time if we were obliged to remove the supports from these projecting figures before the concrete had developed considerable strength it would certainly fail. To overcome this difficulty the pieces of the mold were made with the shape of the joints reversed. Ordinarily the joints are made to resist pressure from within; they are interlocking and can only be broken by removing the pieces of the mold in the reverse order to that in which they are made. But these pieces were made so that they could be removed separately, replaced and propped after the concrete had been surface treated. The mold for the 'Fountain of Time' was probably the largest plaster piece mold ever made. It consisted of about 4500 pieces of various sizes. The smallest were about 12 inches across and weighed 25 pounds, the largest were about 30 inches by 4 feet, and weighed over 1000 pounds.

"In preparation for the core which was to establish the thickness of the concrete and keep it in contact with the mold a survey of the model was made and contours were drawn at every foot of elevation. Outside of the model wires were stretched parallel to the center line; from these measurements were taken which were translated into their co-ordinates in order that the work might be laid out from a center line. The contours were sawed from wood and assembled in their proper places. They were covered with metal lath and coat of cement mortar composed of one part portland cement and three parts building sand. The mortar was applied with a pointing trowel and without an attempt to compact it. It was a lean mix and hard to apply, but it hardened and formed a very porous base well suited to the work it was intended to do.

"It so happened that our engineer was the first man on the job, which disturbed Mr. Taft not a little. It was difficult for him at first to understand what part a civil engineer could have in the work of a studio such as mine on a monument such as his. His difficulty, however, soon departed when he saw the application of modern principles to an old art.

"When the core was completed timbers were attached vertically to the base by bolts screwed into sockets provided for that purpose. The timbers were connected to each other at the top by joists. They formed supports against which the mold was braced and being attached to the concrete base were by far superior to supports set in the soft soil which surrounded the fountain. They also served as pole derricks to which we attached rigging and by which we hoisted all the molds and materials.

The Concrete Mix

"The concrete was made of Potomac River gravel selected to contain particles carrying in color from white to yellow to brown and crushed and arranged in size so that at the distance of one hundred feet the surface of the concrete would appear uniform in color and texture. The general hue of the concrete is yellow red of bright value and weak chroma (YR7/2) as noted by the Munsell System. This is called a 100-foot concrete because the particles on the surface blend to a uniform color and texture at that distance. Concrete may be designed to resolve to hue at any distance, at 25 feet for interiors, at 50 feet or at 1000 feet for bridges. In order that the concrete might completely fill so complicated a mold it was necessary to mix it very soft. In order that it might not shrink away from the dome-like surface of the mold it was necessary to mix it very stiff. This

(Continued on page 50)

A farmer substituted concrete fence posts for wood.

The results were as evident as they were gratifying.

Things That Make the Customer Buy From You VI

By John Lee King

It has been said that there are sins of omission as well as of commissoin, and it is certainly true that in business sins of either kind have a way of defeating the business man's attempt to win his share of the Ultimate Consumer's dollars. Then, if you mix sins of commission with sins of omission, you certainly have greased the skids of your prospect and headed him down hill away from your cash drawer.

That is why it strikes me that a little consideration given to the matter of complaints and their adjustment is worth the space of this page and the time it takes to write—and read—it. For there is none of us wise enough to avoid mistakes; there are too few of us wise enough to capitalize those mistakes to our advantage when they occur.

Now certainly a complaint represents a sin either of commission or omission or both—either a delivery of goods that did not come up to specifications, a bill that is too large, or a delay in a delivery promised. After the complaint is made it is easy enough to repeat both sins all over again—handle the matter in a grumbling tone of voice, refuse to admit the error, or adjust it, with an implied distrust of the customer's honesty, or again delay in giving satisfaction.

Now let us take a look at this complaining customer—remembering that at one time he must have been fairly well sold on us and on the goods we handle. Certainly a bird in the hand is worth two in the bush, and a consumer that has bought from us, even though he turn up again with a complaint, is more valuable than two prospects yet to be won to our patronage. It ought to be worth some effort and thought to turn his dissatisfaction back into satisfaction, to win back his confidence from the slough of distrust into which our past actions or lack of actions has thrown it.

He feels cross about the matter, naturally, and how easy it is for us to reflect crossness back to him, tempering our expressed regrets that our service or our goods did not please with a tone about as cheerful as gloom. If that is the manner in which we handle the situation, then we can expect to win this formerly satisfied customer of ours over to our competitor—I know not a better way to accomplish such an end. None of us likes to be criticised or be found fault with—it is as natural as living to resent it.

How then are we going to turn an unnatural attitude into a natural one—how may we school ourselves in such a way that we will instinctively greet complaints with a sincere desire to correct them, welcoming their report because it gives us the opportunity to do so? I think the answer to that question brings us back by the shortest route to the basis of all successful business: that that business succeeds most that serves most. In order to put ourselves into that attitude it will be necessary for us to have for our keynote and that of our business the desire to serve to the utmost.

We are on the selling side of the counter—the "service" side; our complaining customer is on the buying side, the "being served" side. If we can serve him completely in adjusting his complaint we have wiped out his resentment and he will be back to be served again.

A case of this kind struck me forcibly recently. I was the complaining customer. I had ordered a number of calendars printed for 1924 with certain copy upon them. The order sent to the calendar house contained the name of the company first in the order and second as a mailing address. It was spelled differently in each case by my stenographer and when the calendars arrived the misspelled name had been used.

I felt it was partly my mistake, although I was on the "being served" side of the transaction, and in writing for duplicate calendars suggested to the seller that any adjustment he saw fit to make would be satisfactory.

He looked up his order—it showed that the original error occurred in my office. He promptly sent me a letter telling me that he felt that his composing room should have noticed the two spellings, caught the error, and not made the mistake. Because of this, he offered to reprint the calendars correctly free of charge.

As it happened the first time I read the line about the error I misread it so that I thought he said I should have caught this mistake, and involuntarily a feeling of resentment rose up in me. Then I reread it and immediately had a sense of appreciation of the more than fair manner in which he had handled the matter. You may be sure that year after year he will receive my order for calendars. The mistake was one that any calendar house might have made, particularly in view of our mistake to begin with; the way he handled the complaint could not be done better by any calendar house in America; then why should I change my business? Not on your life—that complaint and the way it was handled will be the reason why this Ultimate Consumer continues to patronize that firm.

Now take another instance. I place considerable advertising for the firm that employs me. Certain matters came up between one of the publications we patronized and ourselves, matters in which we felt we were being treated unjustly. I registered a complaint and instead of being given the courtesy of an effort to correct the matter, I was told that "if we thought we could buy the policy of the paper" through our advertising "we'd better pull the ad out." Then the matter was ignored entirely, although before I had left the paper's office it was admitted I was in the right.

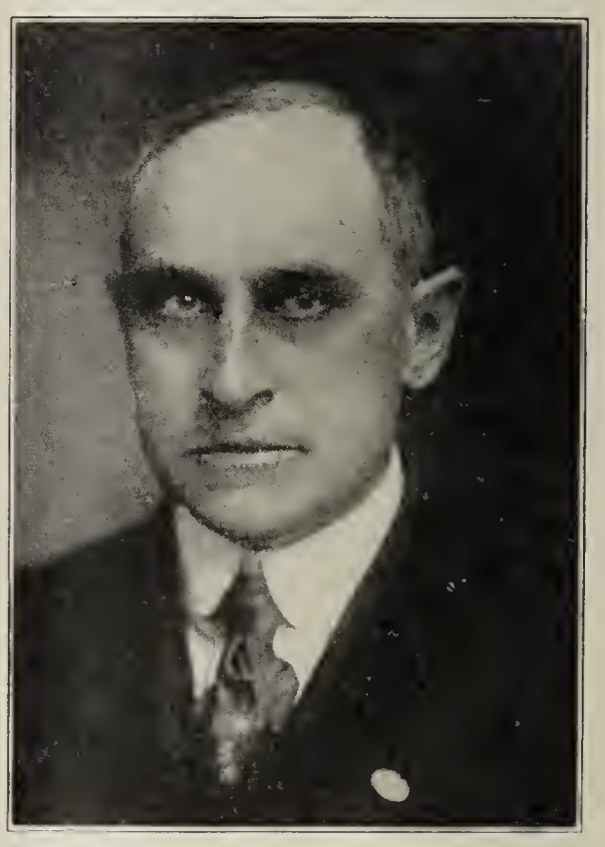
Is there any wonder that we no longer advertise in that particular publication, although we for years had spent upwards of $1500 yearly with it? Evidently the men representing it have twisted their viewpoint to the place where they feel the paper is the one on the buying—"being served"—side of the advertising department, while the companies that patronize it are on the selling—"serving"—side of the matter. My serving is being performed for my firm; I expect to be served by those to whom we give advertising. And when I am not, but instead am affronted with unjust accusations, in self-defense I go somewhere else to be served. And don't forget that I am made of the same stuff as the fellow who comes into your office with a complaint about your goods. your service, or what not. I am the same chap who has made up his mind to patronize one calendar house indefinitely, and at the same time never again to patronize a particular journal.

And that is the object of being in business—service. It was expressed centuries ago in the phrase, "If you would be the master of men, serve them." There is no qualifications as to the manner in which you shall serve them—just serve them at every opportunity and as completely as the limited human ability you possess makes possible. And at no point in your contact with the people that buy from you can you serve them better and more profitably than in the handling of complaints—for if you can soothe injured feelings you have done a real service, an unforgettable service, indeed.

Honor "Dick" Hardy

The city commission of the city of Chattanooga recently selected Richard Hardy, president of the Dixie Portland Cement Company, for mayor of that flourishing city, and in so doing, secured as "skipper" of the city government one of the most virile characters who has ever been connected with American construction industries.

"Silver Tongue Dick" Hardy, whose ready wit and human impulses have made him dearly beloved by a host, reaching down to the last negro laborer in his cement mill, is a native of Michigan and a product of the university at Ann Arbor. Of late years he has served his Alma Mater in capacities of great trust; he has represented the cement industry on many matters of national importance and for many years was vice president of the Portland Cement Association.



After he left college Mr. Hardy taught school for a number of years, which may account for the fact that he has been recognized as a leader in every movement to increase the educational work of the cement industry, exhibiting the greatest interest in efforts to teach the boys how to use concrete. Lately he has become so much interested in the concrete products business that he established a great factory in his city to supply local needs. Mr. Hardy is a confirmed golfer, a baseball enthusiast, a man of simple words and firm but kindly action.

Concrete Culvert Pipe Shown to be Superior

The unprecedented era of highway building in which federal, state, county and municipal governments are all active at the present time, has attracted unusual attention to the design of culverts. Hard roads must have stable subgrade and proper run-off for surface water is of prime importance. Culverts must be permanent in character and adequate in size. Only recently have various culvert materials been carefully compared and proper classification of them made, with due regard to the effect of frictional losses in reducing the capacity of the lines.

C. E. DeLeuw, a distinguished hydraulic engineer of Chicago, discussed this subject in most illuminating fashion in a recent issue of *Municipal and County Engineering*, pointing out the very marked differences in capacity between concrete pipe and its chief competitor, corrugated metal pipe. Mr. DeLeuw says in opening his discussion: "The ever-increasing scale of labor and material costs is causing the designing engineer to make a more critical examination and analysis of his designs. Culvert designs generally have been made on the basis of waterway opening required, without regard to friction losses and other hydraulic factors which affect the capacity of culverts." In support of these statements Mr. DeLeuw presents the results of conclusive studies at the University of Iowa and elsewhere, which are of unquestionable importance to those of our readers interested in the applications of concrete to hydraulic purposes:

University Experiments

"A comprehensive investigation on the flow of water through pipe culverts was conducted at the hydraulic laboratory of the State University of Iowa during the summer of 1922. Tests were made on commercial corrugated metal pipe of 12, 18, 24 and 30-inch diameter. To determine the effect of the length of the culvert on flow, the 24-in. pipe was tested in 24, 30 and 36-ft. lengths. The other sizes were tested in 30-ft. lengths only. The number of tests (almost 1,000) warrant considerable confidence in the results obtained. The experiments were conducted by D. L. Yarnell, Senior Drainage Engineer, Bureau of Public Roads, U. S. Department of Agriculture, and Sherman M. Woodward and Floyd A. Nagler, Professor and Associate Professor, respectively, of Department of Mechanics and Hydraulics, State University of Iowa.

"These investigators made a study of a number of hydraulic factors in culvert design such as entrance losses for different types of entrances, effect of carrying elevations and culvert and the coefficient of roughness "n" in Kutter's formula. From these experiments, the following average values of the coefficient of roughness were found:

Diameter of Pipe Inches	Kutter Coefficient Corrugated Metal Pipe
12	0.019
18	0.022
24	0.022
30	0.023

Earlier Tests

"These results check with the somewhat meagre data obtained prior to these tests for corrugated metal pipe. In 1913, Cone, Trimble and Jones conducted tests on a semi-circular corrugated metal flume having an arc length of 132 in. and a total length of 1,745 ft. The coefficient of roughness ("n") obtained varied from 0.0196 to 0.027, depending upon whether the flow was measured on a tangent or on a curve. In 1917 the Bureau of Public Roads conducted tests on 8-in. and 10-in. corrugated metal pipe 200 ft. in length. The coefficient of roughness ("n") obtained for the pipe flowing full varied from 0.017 to 0.021.

"There is an abundance of data available on the values of "n" for concrete pipe. Many tests have been made not only in the laboratory, but also in the field on structures of great length and built under varying conditions.

Data from Bureau of Public Roads

"The Bureau of Public Roads of the United States Department of Agriculture published Bulletin 852 on "The Flow of Water in Concrete Pipe" in 1920, which contains the data gathered from a great many tests. Many of these data were from the records of the U. S. Reclamation Service and also from the leading consulting engineers in many sections of the United States and Canada. Tests of many existing concrete pipe lines, including the Victoria, B. C., aqueduct, which is 42 in. in internal diameter and 27 miles in length, are presented. This Bulletin is the most complete and authoritative work on the value of the coefficient of roughness for concrete pipe. After reviewing all data presented, the following suggestions are made for "n" in Kutter's Formula:

Class 1. (Old California cement pipe lines.)
n=0.013 for pipes up to 10 in. in diameter.
n=0.014 for pipes from 12 to 24 in. in diameter.
n=0.015 for pipes from 26 to 42 in. in diameter.

Class 2. (Modern "dry mix" concrete pipe and monolithic concrete pipe or tunnel linings made over rough wood forms.)
n=0.013 for pipes up to 36 in. in diameter.

Class 3. (Small "wet-mix" pipe in short units; "dry-mix" pipes in long units; average monolithic pipe made on steel forms.)
n=0.012 for pipes up to 24 in. in diameter.
n=0.013 for pipes more than 24 in. in diameter.

Class 4. (Glazed—interior pipe lines; monolithic pipe lines where all interior surface irregularities are removed—only highest grade of workmanship and materials.)
n=0.011 for pipes from 12 to 24 in. in diameter.,
n=0.0115 for pipes from 26 to 28 in. in diameter.
n=0.012 for pipes more than 50 in. in diameter."

Conclusions

In conclusion Mr. DeLeuw says:

"It will be noted that the coefficient of roughness increases with the increases in diameter of both concrete and corrugated metal pipe. For the purpose of making a comparison, however, this slight variation has been neglected. In order to compare the carrying capacities Table I has been prepared showing the capacity of various sizes of pipe. For concrete pipe a value of "n"=0.013 is used, because the character of workmanship and finish of a culvert is not generally of as high a grade as in sewer construction. Reference to the above table of values, suggested in Bureau of Public Roads Bulletin 852, will indicate that this value of "n" gives a proper factor of safety. For corrugated metal pipe a value of n=0.021 is used: The pipes are figured as flowing full. The entrance and velocity losses are disregarded as they are practically the same for each material with a given type of entrance.

"Similar computations were made for pipe culverts of the same materials on different gradients and show that the percentage of comparative capacity is independent of the gradient. The practical application of these data in highway construction is apparent. It can be seen readily that a 12 in. concrete pipe can be substituted for the 15 in. corrugated metal pipe, a 15 in. concrete pipe for an 18 in. corrugated metal pipe, the substitutions continuing in the same proportion as the diameter of the pipe increases."

TABLE I—DISCHARGE OF PIPE CULVERTS ON A ONE PER CENT GRADIENT

Internal Diameter of Pipe Inches	Water Area in Square Feet	Discharge of Corrugated Metal Pipe in Cubic Feet per Second	Discharge of Concrete Pipe in Cubic Feet per Second	Carrying Capacity of Concrete Over Corrugated Metal Pipe, Per Cent
12	0.79	1.83	3.40	86
15	1.23	3.44	6.35	85
18	1.77	5.70	10.17	79
24	3.14	12.70	22.78	79
30	4.91	23.60	41.73	77
36	7.07	39.10	68.22	75
42	9.62	59.45	102.93	73
48	12.57	85.84	147.44	72
54	15.90	118.14	201.61	71
60	19.64	157.91	267.30	69

A new form for molding concrete gutters recently put on the market by the Heltzel Steel Form and Iron Company of Warren, Ohio.

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Advertising Rates Sent on Application

Cement Brick Here to Stay

Clay brick have been standard for so long that the world evidently was not at first willing to accept other kinds. The concrete product has, however, been found so eminently satisfactory and ultimately economical that by the sheer force of its superiority it is now asserting its right to supplant the clay product.

At first concrete brick were made in dull shades, but now processes have been perfected whereby they may be made any color and may at the same time retain all of the other advantages of concrete construction. Their use has been their greatest advertisement. Attractive homes built of the new material have sprung up all over the country, and an increased demand has followed them. Today new concrete brick manufactories are daily coming into existence and, it would seem, are virtually pioneering the way for a field which is soon to become most lucrative.

Cement As An Art Medium

The use of concrete in constructing the immense piece of statuary described elsewhere in this issue is but another tribute to its versatility and its capacity for beauty. Lorado Taft had designed his model but could find not suitable material into which to translate it. He considered everything. Then some one suggested the use of cement and showed him that it was a wonderful material well suited to his needs. So he tried it.

The result is that the largest piece of statuary on a single base in existence today is made of a mixture of portland cement and suitable aggregates.

In this instance the concrete was placed in a mold, but in other cases figures are chiseled directly from concrete blocks. Last month this paper carried a picture of a saber tooth tiger statue which had been made by this means.

But whether a mold or a chisel be used matters but little. It is now recognized that concrete, embodying as it does great strength, ease of manipulation, and untold possibilities in combination with various types of colored aggregates, has asserted its right to entrance into the field of the fine arts. The future will no doubt see that use more fully developed.

Coolidge Is President

As this issue goes to press, the delayed message of President Coolidge is made public. The sphinx from New England has at last spoken. He has not hesitated to voice his opinions.

The message is a gem of brevity and candor. Its author has spoken in such a way that his people may understand, and he has made it plain that he wants American advancement whether or not he is returned to the White House at election time.

The President has declared himself for the further lowering of both local and national taxation. In that he is economically sound. Industry cannot prosper when it must support extravagant government.

We Americans work six days a week. We get five days' wages, and the government gets the pay for the sixth day. Anything which will decrease taxes will make for individual and for national prosperity and happiness.

Congress will do well to consider seriously the points brought forth in the presidential message. And as it does so, it might do well to bear in mind that America prefers action to talk.

The Awakening Giant

For many years cotton has not only been king of the south, but has also been the absolute ruler. Nothing else mattered much. Owners of plantations raised their crops year after year and were content to buy everything they needed from the industrial north. As a matter of fact most of the cotton itself was spun in the factories of New England.

But now the south is realizing that if it is to develop as it should, it must have other industries. The south has not only realized the need, but it has taken definite steps to satisfy it. The steel mills of Birmingham are among the greatest in the country. Cotton mills, although not so numerous or successful as those of the north, where experienced labor is obtainable, are gradually growing in number and importance.

Even in the case of the manufacture of such a commodity as cement the south was deficient. It had few mills and was content to bring in all the cement it needed. But as other industries developed, the need for the "king of building materials" became more acute. Factories were springing up. Schools and buildings were being built. Cities were being developed. And now the south has come to the front with great appropriations for roads. Cement uses became more numerous, and with them came the realization that the product could be manufactured just as well at home and that it could be sold cheaper. The result is that the southern states are gradually forging to the front in the matter of cement manufacture. Only recently the new plant of the Phoenix Portland Cement Company near Birmingham was opened. It is one of the most efficient of its kind in the country. Now the Signal Mountain Portland Cement Company has begun production at its fine modern plant near Chattanooga. The Hermitage plant has also started operations. Down in Texas the San Antonio Portland Cement Company is working on a new plant at Dallas. Numerous other mills are rumored for the various scattered points of that great section of the country in which cotton was formerly king.

Industry is coming to the fore below the Mason-Dixon line. With it will come great wealth. The cry has long been "Go west, young man, go west," but it could now well be changed, for the young man who is ambitious to start his career in one of the most promising sections of the land, "Go south, by all means, go south."

Shall the State Operate Cement Plants?
VIII

The Final Article of the Series Discussing the Advisability of State Owned Industrial Plants

In the preceding articles in this series, of which this article is the last, we have endeavored to show purely economic reasons why the conduct, control or ownership of a private industry such as the manufacture of cement by state governments is impractical, unworkable and untenable. We have discussed various attempts at governmental ownership and operation of private industry—costs have gone up, service has gone down, and government has invariably returned such businesses to private capital that they might, under the stimulus of interested control come back to health and service.

Let us then leave the field of economics and in this article discuss the political phase of a state government undertaking to operate cement plants for the production of road-building material. Certainly if such an undertaking be done it will place the industry into the realm of politics and more or less out of the realm of economics, since, by the nature of the case, government, be it state, national or city, is primarily political.

Although it is untrue that politics per se are tainted unfortunately in America we have developed a distrust of them and of the majority of men who enter them. This can be credited, perhaps, to the fact that the new country of the United States had no trained political leaders; that, as the country came safely through its formative stage due to the guidance of great, public-spirited men, the field of economics offered such far greater rewards than did, or does, the field of politics, big men began to refuse to hold office, to shun politics, and to look down upon the profession. The result has come that the majority of the men who follow politics as a profession too frequently are as selfishly interested in their own advancement as their duty demands they should be in the public welfare.

To such a pass have things come in America that it is difficult to get many real business men to serve two weeks on a jury, say nothing of four years in the White House, state senate or city council! A one-fifth vote of the enfranchized citizen of a city the size of Chicago is considered good! No wonder that politics, the science which underlies the social structure of our nation, has degenerated into a pseudo-science akin to alchemy.

That politics has an important function to perform no one who thinks will deny. Although we have not yet learned, as many a private industry has learned, the importance of offering high rewards in return for public service, the day must come when the welfare of the nation as a whole will be placed ahead of the welfare of the individual industry, and in that day we will pay remunerations for public service that will justify specialists in government to guide the Ship of State on its course. And then those specialists, like specialists employed to control private industries, will hold government to its appointed tasks, and not permit it to wander far afield to the detriment of all.

Police power has been properly delegated to government, as well as the conduct of public schools for the education of the public. Think a moment—isn't there yet considerable improvement needed in just these two functions of government that might well occupy the thoughts and actions of our various political bodies for years to come? What private industry would tolerate the flagrant breach of its rules that are tolerated by state, city and nation of the laws of our land? In the educational field, although we undoubtedly rightly boast the best school system of the earth, there remains much yet to be desired.

In private industry we have learned that the greatest amount of real results can be accomplished through division of labor—the ordinary concern divides itself under a board of directors and presidency into production, sales, accounting, order, advertising and other departments. One company devotes its entire attention to the production and sale of one product or of a series of allied products; it does not spread its shot, and so miss its bird, among a variety of products.

Politics, if it will function as it should in behalf of public welfare, must do the same. It must confine itself to those activities for the performance of which it was created by grouped individuals. When it diffuses its force into many lines of endeavor—into policing, educating, transporting, nursing, and tucking into bed, then the poor individual whom it is charged with serving finds himself eventually with no bed into which to be tucked.

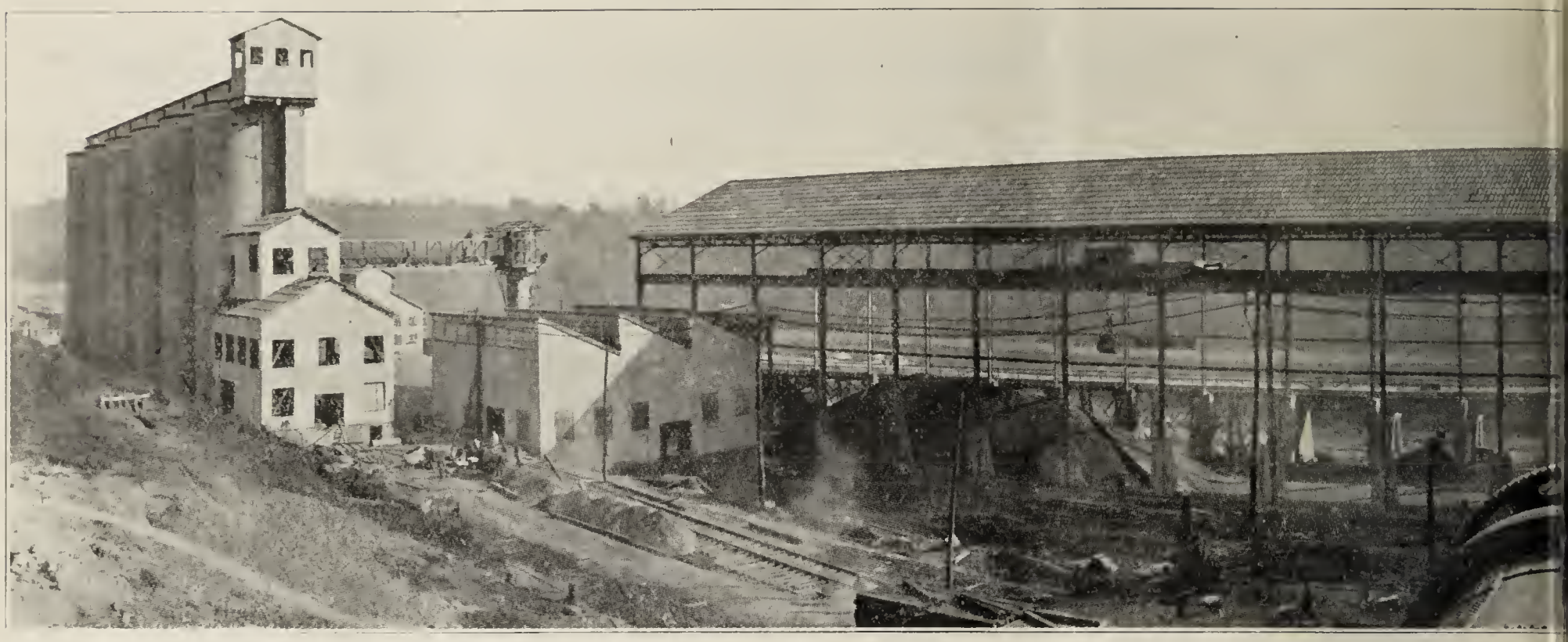
Then again, we take a man trained to politics—and by that token trained away from economics—and tell him to be the controlling spirit behind a state owned cement plant. We might just as reasonably expect an expert blacksmith, from the hamlet of Odebolt, Iowa, to make an efficient United States President.

Such a man might be well-intentioned; he might have at heart accomplishing all the objects that were promised to be accomplished by the politicans that brought to pass such an operation of a plant, yet his ignorance would lay him open to the plottings and schemings of any unscrupulous men or group of men that came along—and the resultant loss would be borne not by him personally but by the public as a whole.

Then again, to turn over to politics private business is to open a field of temptation green with the clover-leaves of unearned, dishonest profits. We might well face the facts before as afterward: our political history does not warrant the expanding of responsibility placed in official hands—it warrants a restriction of responsibility to the field of politics carefully surrounded by safeguards in the form of an enlightened, voting public.

Since then economically the state cannot produce cement as efficiently as can private capital, and since to turn over to government private business is to enhance the difficulties of obtaining the proper carrying out of proper governmental functions, isn't the proper answer to the question, "Shall the State Operate Cement Plants?"—

NO!



At the left are the cement storage silos eighty-five feet high. Adjacent to these is the finish grinding department. The long the kilns, shown in the center, is the housing over the burner's floor. At the right of the kilns is situated the coal grinding

Signal Mountain Starts Production

The Magnificent New Plant at Chattanooga Now Operating Commences Its Career Under Auspicious Circumstances

At high noon on Friday, the 12th of October, kiln Number One of the Signal Mountain Portland Cement Company, Chattanooga, Tenn., went into production. As this is being written, kiln Number Two is being fired and the finish grind department is in full operation, thus bringing into production the entire two-unit installation of the Signal Mountain plant. By the time this is in print, the first shipments of finished cement will have been received at their destinations.

The completion of this plant establishes a series of records in construction. Ordinarily, not less than twenty to twenty-four months is estimated as the time necessary to build and put into full operation a cement mill of even comparatively small capacity. Considering the fact that the Signal Mountain plant was built in sixteen months, and that, when full production is begun, it will have a daily capacity of five thousand barrels a day, it will be seen that its constructors have accomplished a wonderful installation within a remarkably short space of time.

Walter A. Sadd

This plant is situated about five miles north of Chattanooga, on the Dixie Highway. The site was selected after an exhaustive survey by the experts of the Cowham Engineering & Construction Company, which had charge of the design and building of this plant. It is located in a remarkably advantageous situation both from the standpoint of the available supplies of raw materials and of a shipping point, the plant occupying a strategic position that is the envy of most of its competitors. An additional advantage is a mile of water front along the Tennessee River. This frontage affords fine docking facilities and a consequent outlet for freight via water. From this water front the company's acreage rises gradually towards the face of Signal Mountain.

The profits from cement, probably more than on any other commodity, depend greatly upon transportation facilities. It is well, therefore, to sum up the very favorable location of this new plant thus; there is a paved road leading directly into the heart of the business section of Chattanooga; a belt line of railway from the tract connects with nine railroads; these in addition to the water transportation above mentioned.

The land of this company contains all of the raw materials necessary for manufacture. In extent it is 406 acres and contains enough material to continue operation at the rate of 1,500,000 barrels per annum for the next seventy years. Core drill tests to the depth of 400 feet have shown limestone high in calcium and low in magnesia, which, together with the adjacent clay deposits, all within the acreage, make an ideal condition for cement manufacture.

The engineers have arranged the layout of the plant in such a way that gravity does most of the work. From the raw material to the finished clinker full advantage has been taken of the natural slope of the land, thus effecting great economies in operation.

Standardized Equipment

Before the plant started operation the engineering features had excited favorable comment in engineering journals both in the United States and abroad, as no effort has been spared in procuring the most modern machinery and equipment for the economical production of cement. This equipment is carefully standardized and is of extra heavy con-

John L. Senior

building in the background contains the storage for limestone, clay, coal, gypsum, and clinker. In the middle background over department. At the extreme right is the raw grinding building. The tracks at the right lead to the stone quarry.

struction, obviating as much as possible losses accruing from break-downs. These losses are further minimized by an ample store of spare parts and machine shop equipment so that repairs can be readily effected.

Mention has been made of the advantages taken of the gravity flow afforded by the natural slope of the land. The completed plant with its highly efficient producing capacity carries less materials on conveyors and elevators in proportion to its total production than any other cement plant in America.

The limestone quarry is located a little less than a third of a mile west of the plant proper. The deposit includes 100 acres of limestone running 400 to 500 feet deep, sufficient for an operation for three-quarters of a century. Aboveground the stone slopes about five degrees west. The operating face at this writing is 800 feet long and fifty feet high. If necessary, this can be increased to 2000 feet in length and 175 feet in height.

The clay deposit is located across the road from the plant. This includes 75 acres of clay running to a depth of 25 feet. It is in a solid bed requiring no stripping and can be readily loaded by means of a steam shovel.

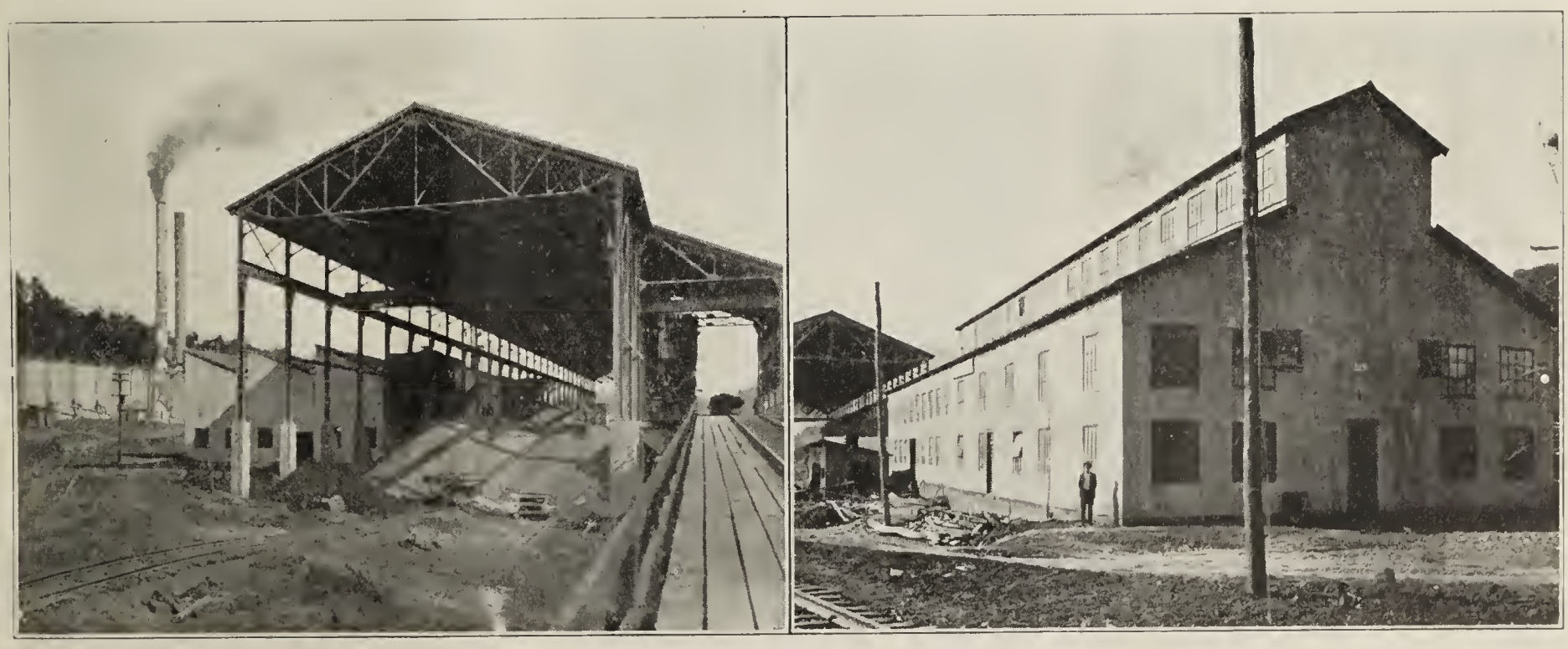
A complete track layout was furnished by the Kilby Frog & Switch Company of Birmingham, Ala.

The company has two steam locomotives for the necessary switching services. These will bring limestone to the plant, the cars being taken up on a trestle leading to the crushing plant. Here they will be dumped by air into a gyratory crusher which will reduce the stone to an eight-inch size. The stone is picked up by a pan conveyor and passed to steel storage tank. A traveling grizzly will carry this stone to two Jumbo mills which will reduce it to one and one-half inches. In the same building in which the raw limestone is stored, space has been provided for the storage of clay. This material is brought to the storage in side dump cars of twelve cubic yards capacity. The clay is then passed through a wash mill where it is thoroughly washed and transferred with the limestone rock into the wet grinding. mill. For this purpose a two and one-half yard electric overhead travelling crane with an 80-foot span is used. In the raw grinding department the work is done by Allis-Chalmers Compeb wet mills. The clay is introduced through specially designed feeders.

Ample Storage Space

In starting production of a cement mill a great many companies have come to serious losses in the beginning from the fact that the supply of raw material failed because sufficient quantities were not stored in advance. In the Signal Mountain plant this was carefully guarded against by providing ample space for the storage of raw materials. For example, the raw storage is designed to accommodate 15,000 tons of crushed stone, 5,000 tons of clay, 2,500 tons of gypsum and 5,000 tons of coal. Under the same roof is a clinker storage designed to hold 150,000 barrels of clinker. Long before the firing of kiln Number One this storage was full of materials ready for use.

After the limey and clayey components



At the left is shown the end of the seven hundred foot storage building and the incline up which the stone is brought from the quarry. The illustration at right is a view of the machine shop and laboratory.

A view of the stone quarry showing the locomotives and steam shovel at work. The exposed face is here about fifty feet operation necessary below ground level. Core drills

of the raw mix have been thoroughly ground in the Compeb wet mills to the required fineness, the resulting slurry is taken up by a four-inch rubber-lined slurry pump and passed through pipe lines to the slurry storage tanks that have a capacity of about 6,000 barrels. Compressed air and mechanical methods are used to agitate the slurry.

Capacity Flexible

The kilns are 175 feet in length with two of them now in operation. Because of the unit design of construction the other kilns can be installed without interruption to operation. The plant has been so designed that still further units may be added to take care of increased business as time goes on. In adding these other units the present layout of the plant will in no way be affected.

Firing in the kilns is accomplished with dried and then pulverized coal, elevated to bins above the feeders. From them it will be blown into the kilns, creating a temperature of approximately 3000 degrees Fahrenheit.

After the clinker has been burned it drops down to the rotary coolers through which it passes and falls direct into the clinker storage. From there it will be taken by an overhead traveling crane and passed to the dry mills. After the work of grinding is completed, the finished cement is elevated by bucket elevators and screw conveyors and passed on into the silo storage bins seen in the illustrations.

The Sacking Facilities

There are four sacking houses one at each end of two series of six cement storage tanks. Adjacent to these is the sack department where sacks are repaired for use on the packing machines. The whole plant will be a great credit to the community as it will present a most imposing appearance. Located as it is with a background of great natural grandeur, allowing ample space for the realization of the visions of the engineers, full advantage has been taken of the natural lay of the land. For example, the storage building is 700 feet long and 80 feet wide; the raw grind building 150 feet long; coal drying building 100 feet long and the finish grind building is 150 feet long, the three latter buildings being each 75 feet wide. The complete plant will be nearly half a mile in length occupying as much room as a village. On the grounds are located the offices, shops, stock rooms and the other necessary buildings for the conduct of a large and growing enterprise. Not the least imposing of these buildings are the cement storage silos, 85 feet high and 30 feet in diameter. These are constructed of reinforced concrete. The arrangement of the loading facilities enables the shipping department to load eight cars simultaneously. This is equivalent to 16,000 barrels each working day.

From the simplicity and natural advantages of this layout, it is estimated

C. W. Howard

J. L. Caldwell

C. S. Steward

high and approximately eight hundred feet long. This deposit will last for three-quarters of a century with no quarry show this deposit to be over four hundred feet deep.

that the Signal Mountain plant will be able to manufacture cement at a cost far less than any other known plant. So carefully planned was this construction and so ample are the facilities that it is safe to say that the practices here obtaining will serve as a model for a long time to come. All the machinery and equipment in this immense factory have been constructed with regard to true economy, in that no expense has been spared in getting the best that money could buy.

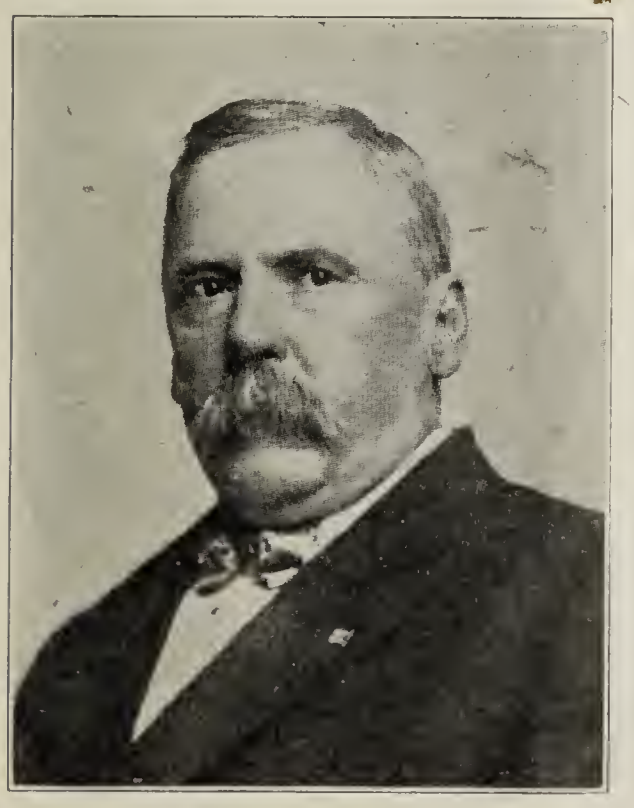
Has Vast Market

In the first part of this article mention was made of the favorable transportation location of Chattanooga. The territory served by the plant comprises a vast empire bounded on the east by the Atlantic Ocean, on the west by the western boundaries of the states of Arkansas and Louisiana, on the south by the Gulf of Mexico and on the north by an arc drawn from the eastern coast of the Carolinas through southern Kentucky and crossing the Mississippi to the western boundary of Arkansas. As freight rates are the factor in cement markets it will be seen that the location of this plant is a highly strategic one. Of the 127 cement plants now in operation in the United States, 50 are west of the Mississippi River and 77 are east thereof. Of the 77 plants east of the River 70 are north of the arc described above and only 7 south of it. From Chattanooga to the arc the new company can compete with all of the 70 northern plants. This means that there are 70 plants to divide the northern business while there are only 7 to compete for the southern business.

To sum up, the plant when completed will have an annual capacity of 1,500,000 barrels of cement. At the present time the demand for cement in the section above mentioned greatly exceeds the production. The United States Geological Survey says that in the first four months of 1923 there were produced in the four southeastern states in which cement mills are located only 2,105,000 barrels of cement, while there were used in the same period 3,921,000 barrels of cement, showing that the demand in this section is much greater than the supply manufactured therein.

The cement industry during the year 1923 has each month broken the record for all corresponding months of previous years, and has each month broken the record of production of the month preceding it. In many cases cement has been shipped while it was still hot. For the year 1924 it may safely be prophesied that the consumption of cement will be in still greater quantities. In the north the winter months will enable some of the mills to store against their future needs. In the south the climate is such that construction, road work and other activities demanding cement will remain in full blast all through the winter months. From these facts it may be seen that the new mill has an assured prosperity.

Chattanooga has become one of the



Charles A. Lyerly

J. P. Hoskins

Paul Steward

Upper views show the storage tanks for the raw mix as well as the kilns and the kiln stacks. At the lower left is shown the open storage building, the machine shop, and laboratory. The tops of the cement storage silos are seen in the background. At the lower right is shown a view of one of the packing houses at the end of the cement storage silos with the finish grind building in center foreground.

highly industrialized cities of the South and the addition of this big cement plant still further emphasizes the progressive spirit of the business men of Chattanooga. The Signal Mountain Portland Cement Company numbers among its stockholders and directors some of the leading business men of the South. Capt. Charles A. Lyerly, president of the First National Bank of Chattanooga, appears as one of the original incorporators of the company.

J. I. McCants

R. S. Conner

A. C. Deer

The idea of a portland cement plant for Chattanooga originated in the mind of Charles W. Howard, the efficient chairman of the Industrial Board of Chattanooga's Chamber of Commerce. After persistent effort over many years, he lives to see his idea materialized into one of the biggest and strongest cement properties in the whole country.

Prominent Men Interested

Walter A. Sadd, chairman of the board of the Signal Mountain Company, is president of the Chattanooga Savings Bank and has been prominently identified with banking interests in the South for many years. Mr. Sadd's interest in the organization since its inception has been an inspiration to his associates in the enterprise.

John L. Senior of Chicago, is president and general manager of the Signal Mountain Company. He is also president of the Peninsular Portland Cement Company, the parent mill of the Cowham System of cement mills. The work in connection with the Signal Mountain Company undertaken by the Cowham Engineering & Construction Company was under his direct supervision. J. L. Caldwell, vice president, is president of the Tennessee Stove Company. C. S. Steward, also one of the vice presidents, is president of the D. M. Steward Manufacturing Company and has taken an active part in the building and operation of the plant. J. P. Hoskins, a member of the board and treasurer of the company, is vice president and cashier of the First National Bank of Chattanooga. The other members of the board are: D. F. McPherson, of Chicago, a member of the firm of Messrs. Cutting, Moore & Sidley, attorneys; F. A. Stephenson, of Mason City, Iowa, president of the Ideal Sand & Gravel Company; Charles Closz, of Webster City, Iowa, president of the Closz Manufacturing Company, and R. G. Wright, of Knoxville, Tenn., president of the Wright-Cruze Hardware Company. Paul S. Steward, assistant secretary, also acts in the capacity of assistant to the plant manager, and had charge of purchases during the construction period.

The operating personnel are as follows: John L. Senior, general manager; A. C. Deer, plant manager; J. I. McCants, general sales manager; R. S. Conner, chief chemist.

The engineering and operating staff is built around a nucleus of experienced cement manufacturers with John L. Senior as general manager; A. C. Deer, operating manager of the plant and R. S. Conner, chief chemist. Sales will be handled by J. I. McCants as manager of that department.

J. I. McCants, general sales manager, was for twelve years with the Standard Portland Cement Company at Leeds, Ala. In that position he made a large acquaintance among cement purchasers of the South. His personality and ability will make his department a factor in the southern cement markets.

Experienced Personnel

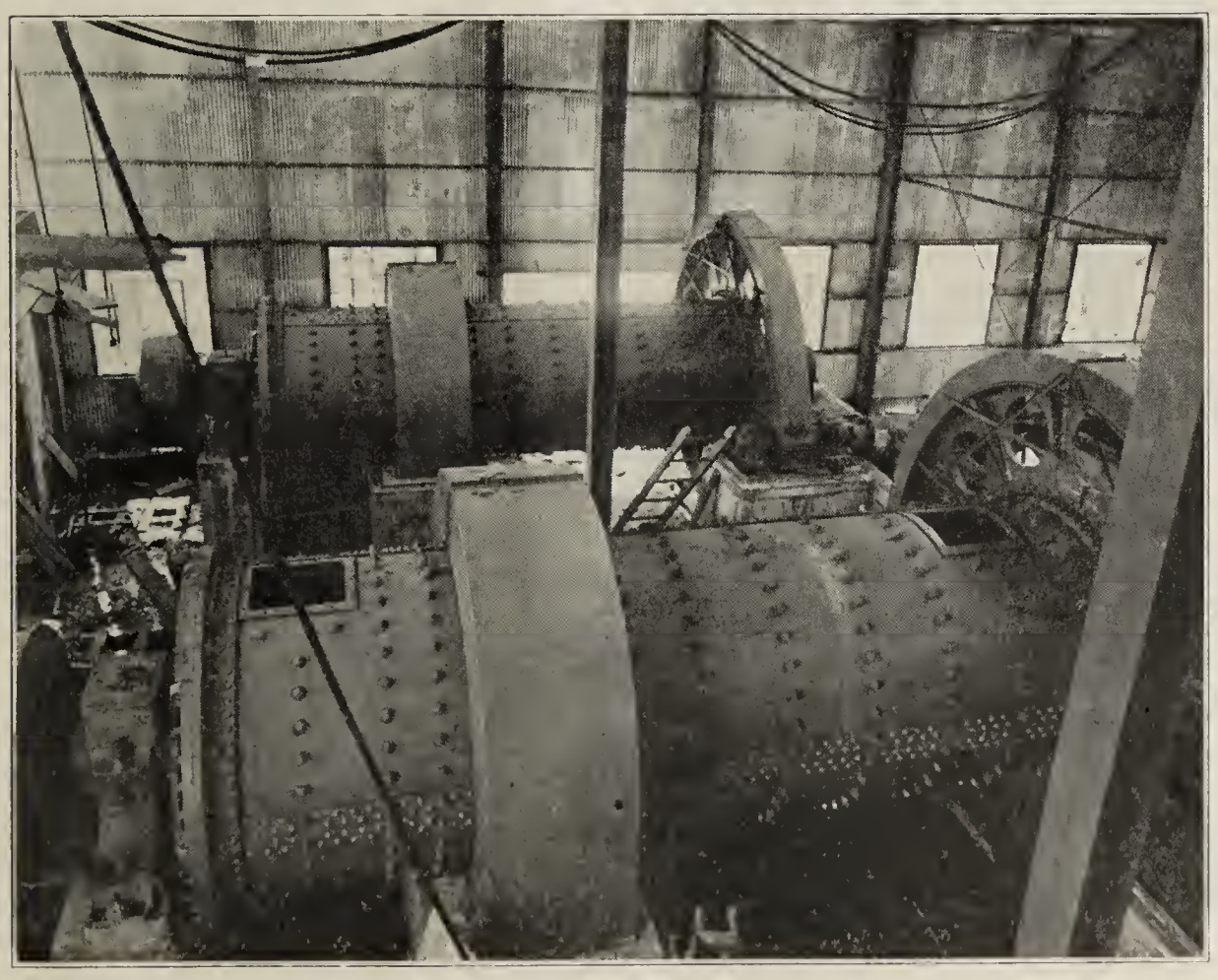
The duty of maintaining the high quality of the product is in the hands of R. S. Conner, a chemist of exceptional ability and experience and a man who has been chief chemist in the Cowham organization for over fifteen years. It is due to the experience and painstaking accuracy of such chemists that the Cowham brands of cement occupy the position they have always held in the cement markets of the country.

A. C. Deer, operating manager of the plant, has been in the Cowham organization for over twenty years and has served in various capacities in nearly all the departments of that organization.

The machinery and equipment were all selected with a view toward both efficiency and production economy. The following firms are represented in the installation:

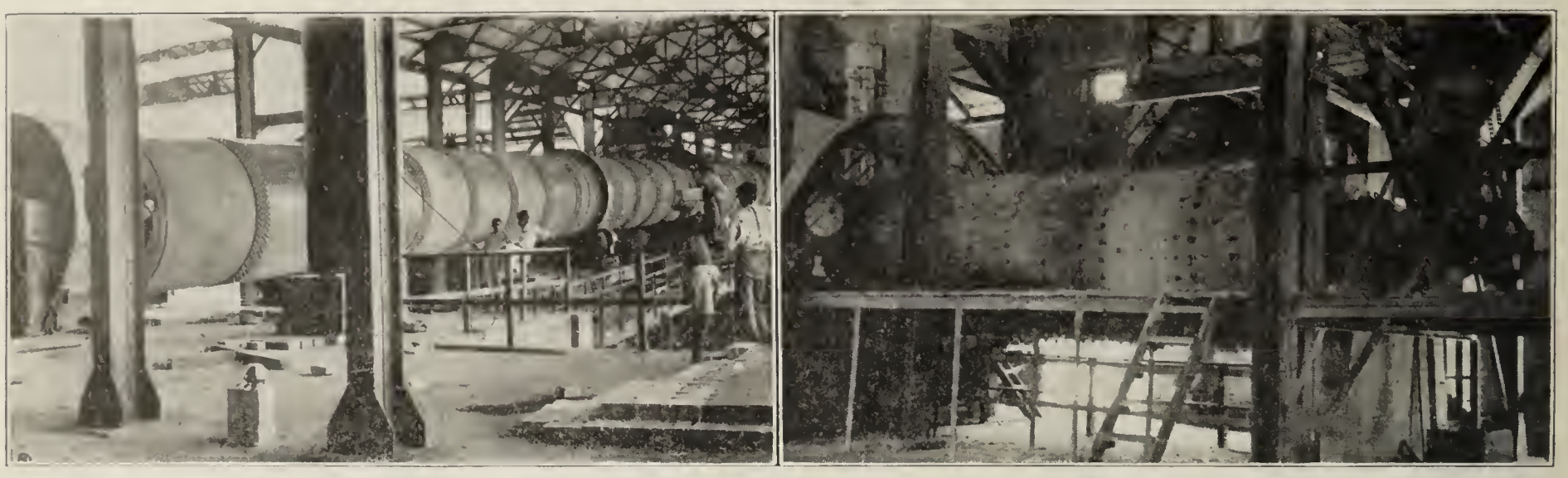
The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., kilns, coolers, grinding mills, coal dryers, primary crusher, hydraulic pumps, wash mill and motors; The Williams Patent Crusher and Pulverizer Co., St. Louis, secondary crusher; The Chain Belt Co., Milwaukee, all elevators; The Fuller-Lehigh Co., Fullerton, Pa., coal grinding mills; The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., electric traveling crane; The Walsh & Weidner Boiler Company, Chattanooga, Tenn., all structural steel and smoke stacks; Mills & Lupton Supply Company, James Supply Company, Rogers-Bailey Hardware Company, Chattanooga, all miscellaneous hardware and fittings; The Chattanooga Boiler & Tank Company, all tank work; The U. S. Cast Iron Pipe & Foundry Company, Chattanooga, all cast iron pipe; The Ingersoll-Rand Co., jack hammers; The Crane Company, special valve fittings for water system; The Chicago Pneumatic Tool Company, Chicago, Ill., and Pennsylvania Pump & Compressor Company, Easton, Pa., air compressors; The Kilby Frog & Switch Co., Birmingham, Ala., all switch material; The Dixie Portland Cement Co., Richard City, Tenn., Royal Brand Cement; The Tennessee Power Co., power; W. J. Mills, Chattanooga, lumber and cross ties; The Dixie Sand & Gravel Company, Chattanooga, all concrete sand and gravel; The Ohio Brass Manufacturing Company, Mansfield, Ohio, fittings for electric railway; The Dudley Bar Sales Company, Chattanooga, reinforcing bars for concrete; The American Cement Tile Manufacturing Co., Pittsburgh, Pa., tile roofing; The Chattanooga Pile Co., poles for electric railway.

In this article we have endeavored to describe as clearly as may be a plant organized and equipped to produce and ship standard portland cement with the greatest amount of efficiency possible. We have shown a plant manned by only 130 men as compared with smaller plants operating with 300 or 400 men. We have shown an ideal location from a manufacturing and freight rate standpoint. In the short descriptions of the personnel of the board of directors and the operating staff, we have endeavored to show that the entire organization is composed of men who have made a success in life and that the affairs of the company are in safe and sure hands. With all of these things it is not hard to prophesy an immense success for this most modern institution.



Two of the Allis-Chalmers Compeb mills.

Chain Belt Company, Milwaukee, Wis., manufacturers of Rex Chain, transmission machinery and conveying equipment, formerly represented on the Pacific Coast by Meese & Gottfried Company, San Francisco, has established direct factory branches and warehouses in Portland and Seattle. Arrangements have also been made with the Washington Machinery Depot, Tacoma, Wash., to carry a large stock of Rex Chain and transmission machinery. Other stocks will be placed in important centers throughout the Pacific Northwest for the prompt handling of local requirements. The Northwest territory, with headquarters at Portland, will be in charge of Allen C. Sullivan, M. E., a graduate of the University of Washington. Mr. Sullivan was formerly connected with the Allis-Chalmers Co., of Milwaukee, and more recently with Smith & Watson Iron Works, of Portland, as chief engineer. Just previous to his association with the Chain Belt Company, he was engaged in special sawmill work as consulting engineer. Don B. Catton, formerly with Meese & Gottfried Co., and later engaged in the machinery supply business on his own account, will be the special sales representative for the Portland office. The Seattle and British Columbia territory will be handled by Wm. F. Nichols out of the Seattle office.



Left—The Kiln, Nine Feet in Diameter and Two Hundred Feet Long. Right—The No. 722 Wet Compeb Mill in the Cement Grinding Department.

How American Methods Win in India

Modern Machinery Makes Hindu Cement Mill Efficient—Electric Driving Units Used Throughout

By W. H. Green

The growth of the Portland Cement Industry in India since 1913 has been very substantial, especially in the last five years, and one more plant of the most modern type has now been brought into operation by the Jubbulpore Portland Cement Co., Ltd., near the city of Jubbulpore, Central Province, India, at a place called Mehgaon. The raw materials utilized are limestone and clay, both of which are found in large quantities close to the factory. The limestone, after being quarried, is taken in side dump cars over a short length of track to the crushing plant, consisting of a large gyratory crusher and a set of rolls. In passing through crusher and rolls it is reduced to small size suitable for mill feed. The clay is also brought in same type of car and dumped into a clay disintegrator, from which it is carried by belt conveyor to wash-mill of the usual type.

Fine grinding and intimate mixing of the materials is done in a No. 722 wet Compeb mill, a slowly revolving steel lined cylinder loaded with forged balls is one compartment and "Concavex" in the other. The limestone brought from the storage on a belt conveyor is fed into this mill along with the clay, making it very easy to control the composition of the resulting slurry to a very fine point, thus insuring a uniform high quality of cement.

The slurry is pumped by means of compressed air into large storage tanks, thence into smaller "correction" tanks where, if necessary, a final adjustment can be made. It is then pumped into the kiln feed tank from which it is fed into the kiln by means of a Ferris-wheel type of feeder. The kiln is nine feet in diameter and two hundred feet long. Its capacity is 1000 barrels.

The burning is done by means of pulverized coal blown in under pressure of air from a fan. The coal, after having been crushed in a pair of rolls and dried in an Ebro coal dryer, is pulverized in a No. 522 Compeb mill of similar construction to that already described.

The hot clinker passes from the kiln through an eight foot by sixty foot rotary cooler. From the cooler the clinker is carried to the storage shed by a Peck conveyor. This conveyor also serves to bring old clinker from the storage to the cement mill where it is ground to a very fine powder in a No. 722 Compeb mill. Any coarse particles are returned to this mill by a fourteen foot "Emerick" air separator.

The finished cement is then conveyed to large cement storage bins and from there it is packed into sacks by Bates packers. All the above processes are automatic. From the time the limestone and clay are dumped the materials are not touched by hand.

All Machines Motor Driven

All machinery in the plant is motor driven, all but the very smallest machines being driven by separate motors. A noteworthy point is the use of synchronous motors for driving the Compeb mills, two of 400 h. p. and one of 175 h. p. These incidently help to improve the power factor of the system. The mills are driven by them through magnetic clutches.

The power plant consists of two Parsons reaction type tubo generators each of 1000 k. w. capacity and capable of a 20 per cent overload. Three phase a. c. is generated at 300 volts and this voltage is used for synchronous motors. The smaller motors, of which there are about 65, are supplied with a. c. at 440 volts. The switch-board of the marble

Left—A View of the Power House. Note Modern Machinery in This Well-kept Plant. Right—A 400 H. P. Synchronous Motor with a Magnetic Clutch Drives the No. 722 Compeb Mill.

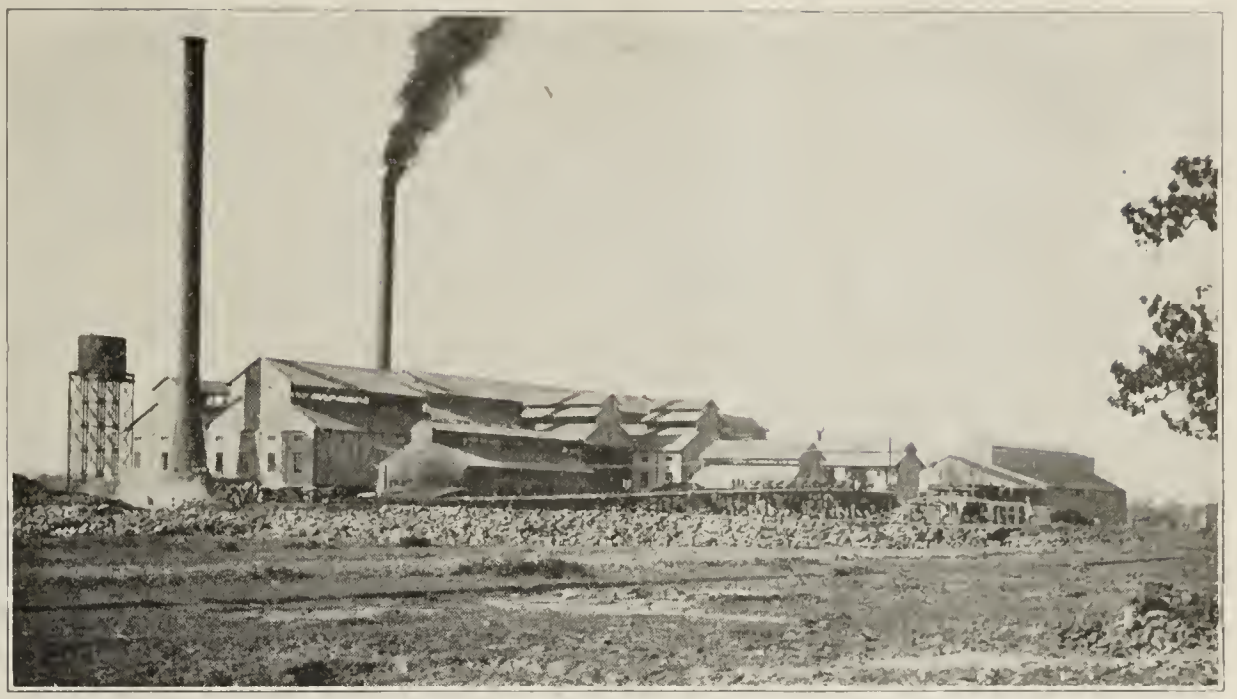
open face type is provided with panels for the various generators and large motors and is fitted with the usual recording instruments.

A small 100 k. w. impulse type turbo generator is installed as a stand-by set for running the kiln and lighting when the grinding mills are stopped.

The boiler house is equipped with three Babcock & Wilcox water tube boilers fitted with superheaters and chain grate stokers, and a Green's economizer. A specially large water softener has been installed to prevent scaling of the boilers by hard water.

Bungalows have been built for the European and Indian staffs and suitable quarters are provided for other employees.

The power house and cement plant machinery were all furnished by the Allis Chalmers Co. The officers are: W. H. Green, general manager; Jas. Boyd, chief engineer, M. M. Ludlow, chief chemist; P. N. Phide (Indian) plant superintendent.



A General View of the American Constructed Jubbulpore Portland Cement Company Plant, of India.

Hermitage Cement Company Plant at North Nashville.

Hermitage Company Plant Nears Completion

The plant of the Hermitage Portland Cement Co., at North Nashville, Tenn., is nearing completion. When operating at capacity it will have an output of 2,000 barrels of cement daily by the wet process.

The plant is of the "straight line" design as shown in the accompanying photographs. The crushing department consists of one No. 18 and two No. 5 Gates gyratory crushers. From the 60-inch by 16-foot revolving screen, the stone is delivered to the two 7 by 22-foot raw grind compeb mills by a belt conveyor. The clay from the wash mill is introduced at this point.

From the raw grind mills the slurry is pumped to the slurry storage tanks, of which there are eight of concrete construction, having a combined capacity of approximately 50,000 gallons.

The burning department consists of two 10 by 150-foot rotary kilns, which discharge into 8 by 60-foot coolers. The clinker is ground by two 7 by 22-foot compeb mills.

The storage house for the finished cement consists of four concrete silos, with a combined capacity of 40,000 barrels.

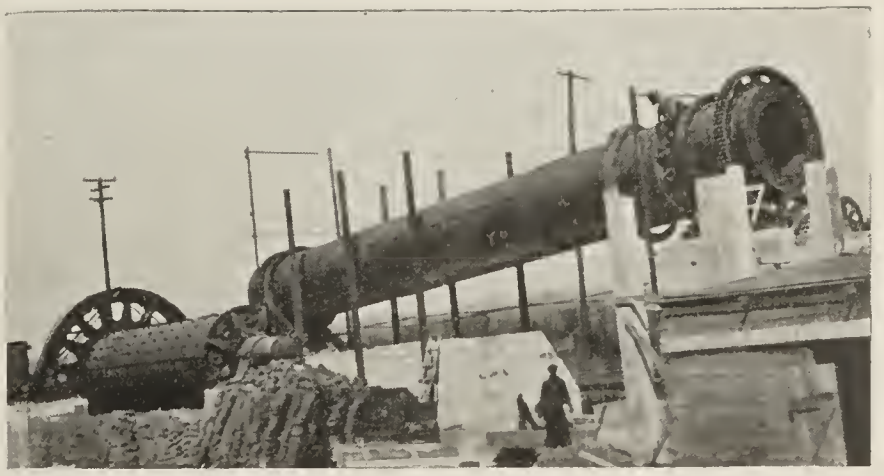
All the mechanical units of this plant are electrically driven by individual motors. Power is not generated at the plant but is purchased from the Tennessee Electric Power Company. The principal machinery was furnished by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

The quarry and clay pits are located within 2,000 feet of the plant.

Officers of the company are: John C. Vance, president; T. L. Herbert, Jr., vice-president; R. D. Herbert, secretary-treasure; R. T. Miller, general manager; Wm. Fowden, general superintendent.

—*Manufacturers Record.*

Looking North from Storage Silos.



Coal Drier and Compeb Mill.

Portland Cement Output in October

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Buchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for October, 1923, were made necessary by the lack of returns from three plants. October production is the record for any month; shipments increased over those of September and are exceeded in 1923 only by those of August. Stocks, although diminishing, did not reach the low level of October, 1922. Production for 10 months in 1923 has nearly reached the total for the year 1922 and shipments thus far are slightly in excess of the total for 1922.

Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in October, 1922 and 1923, and Stocks in September ,1923, in Barrels.

Commercial District	Production October 1922	Production October 1923	Shipments October 1922	Shipments October 1923	Stocks at end of October 1922 (a)	Stocks at end of October 1923	Stocks at end of Sept. 1923 (a)
Eastern Pa., N. J. & Md.	3,340,000	3,342,000	3,403,000	3,922,000	1,091,000	1,055,000	1,635,000
New York	642,000	731,000	769,000	864,000	263,000	380,000	513,000
Ohio, Western Pa. & W. Va.	1,315,000	1,266,000	1,423,000	1,412,000	308,000	159,000	304,000
Mich.	687,000	925,000	685,000	980,000	157,000	177,000	232,000
Ill., Ind. & Ky.	1,860,000	1,933,000	2,143,000	2,056,000	354,000	272,000	395,000
Va., Tenn., Ala. & Ga.	590,000	838,000	607,000	844,000	275,000	272,000	279,000
Eastern Mo., Ia. & Minn.	1,255,000	1,452,000	1,250,000	1,448,000	333,000	625,000	622,000
West. Mo., Neb., Kan. & Okla.	924,000	979,000	907,000	935,000	630,000	697,000	652,000
Texas	330,000	332,000	321,000	326,000	161,000	227,000	221,000
Colo. & Utah	208,000	217,000	237,000	206,000	149,000	174,000	163,000
Calif.	806,000	1,049,000	819,000	1,021,000	196,000	283,000	256,000
Ore., Wash. & Mont.	330,000	286,000	290,000	271,000	232,000	276,000	261,000
	12,287,000	13,350,000	12,854,000	14,285,000	4,149,000	4,597,000	5,533,000

(a) Revised.

Stocks of clinker, or unground cement, at the mills at the end of October, 1923, amounted to about 3,007,000 barrels compared with 3,379,000 barrels (revised) at the beginning of the month.

Production, Shipments and Stocks of Finished Portland Cement by Months in 1922 and 1923, in Barrels

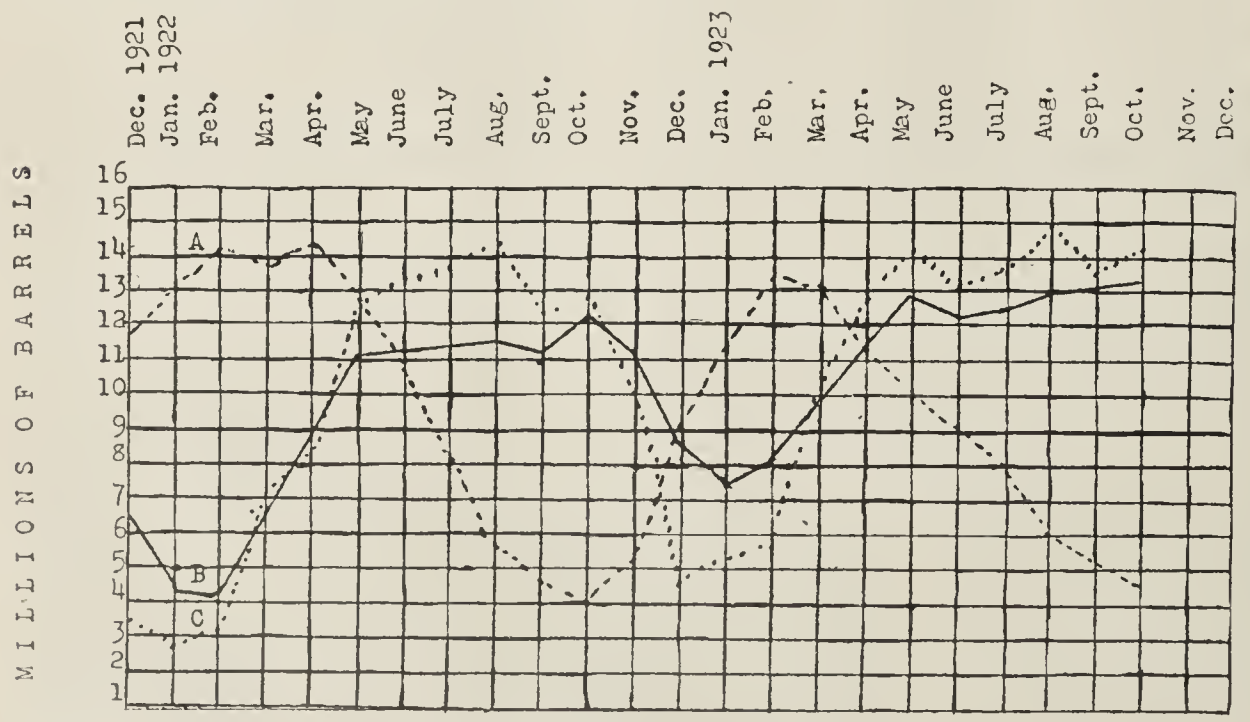
Month	Production 1922	Production 1923	Shipments 1922	Shipments 1923	Stocks at end of month 1922 (a)	Stocks at end of month 1923
January	(a) 4,291,000	7,704,000	(a) 2,931,000	5,419,000	13,316,000	(a) 11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	(a) 13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	11,848,000	(a) 13,045,000
First quarter	15,254,000	25,669,000	13,218,000	21,708,000	.....	.....
April	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	(a) 11,463,000
May	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	(a) 10,144,000
June	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	(a) 9,168,000
Second quarter	31,664,000	36,651,000	34,811,000	40,518,000	.....	.....
July	11,557,000	12,620,000	13,850,000	13,712,000	8,433,000	(a) 8,081,000
August	11,664,000	12,967,000	14,361,000	14,971,000	5,746,000	(a) 6,080,000
September	11,424,000	13,109,000	12,444,000	13,698,000	4,724,000	(a) 5,533,000
Third quarter	34,645,000	38,696,000	40,655,000	42,381,000	.....	.....
October	12,287,000	13,350,000	12,854,000	14,285,000	4,149,000	4,597,000

(a) Revised.

Imports and Exports of Hydraulic Cement, by Months, in 1922 and 1923, in Barrels (a)

Month	Imports 1922	Imports 1923	Exports 1922	Exports 1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	111,559	96,263	77,203
July	957	286,106	119,491	82,774
August	56,757	323,948	105,156	73,201
September	c42,641	215,785	78,615	77,121
October	d65,228	(b)	80,402	(b)
November	61,010	.....	108,798	.....
December	45,860	.....	106,938	.....
	323,823	.....	1,127,845	.....

(a) Compiled from records of the Bureau of Foreign and Domestic Commerce. (b) Imports and exports in October, 1923, not available. (c) Covers period Sept. 1-21. Imports Sept. 22-30 included with October. (d) Includes imports period Sept. 22-30.

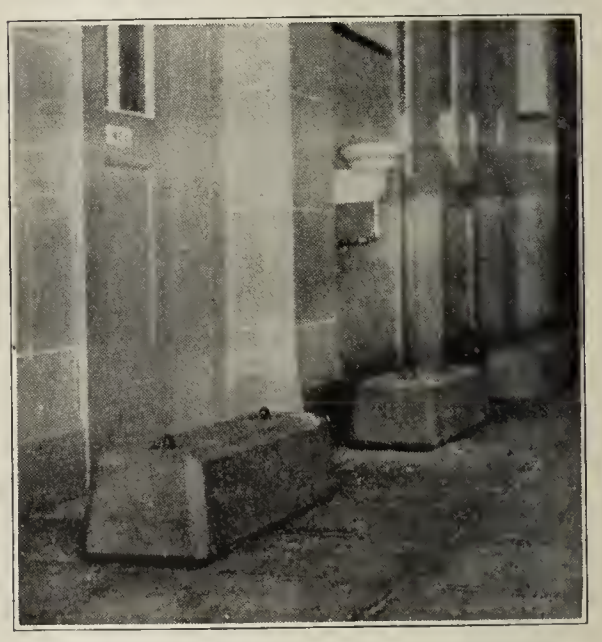


(A) Stocks of finished portland cement at factories.
(B) Production of finished portland cement.
(C) Shipments of finished portland cement from factories.

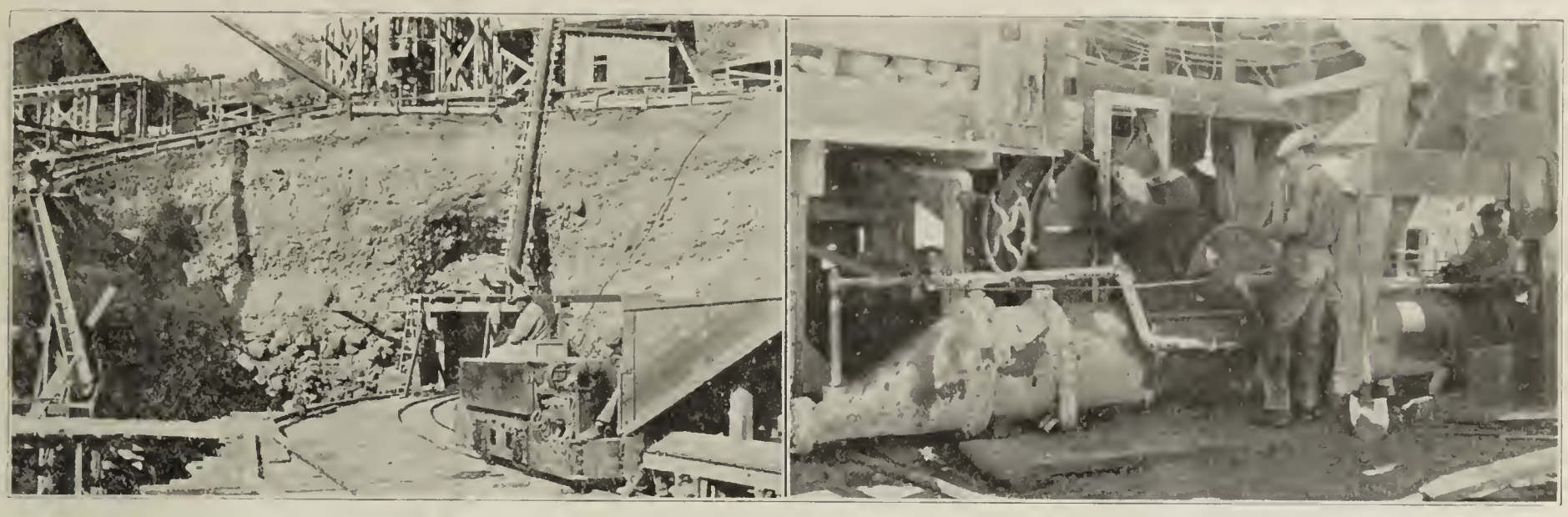
The imports of hydraulic cement in September, 1923, amounted to 215,785 barrels, valued at $379,906. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in September were from Sweden, 57,513 barrels; Denmark, 49,583 barrels; Belgium, 35,846 barrels; Canada: Quebec and Ontario Provinces, 30,514 barrels, British Columbia and Yukon, 2,937 barrels, Maritime Provinces, 30 barrels; Norway, 29,579 barrels; other countries, 9,783 barrels. The imports were received in the following districts: Los Angeles, 99,442 barrels; Porto Rico, 23,317 barrels; Hawaii, 22,930 barrels; Buffalo, 12,284 barrels; Florida, 10,163 barrels; Vermont, 9,323 barrels; St. Lawrence, 8:906 barrels; New York, 7,811 barrels; New Orleans, 6,917 barrels; San Francisco, 6,041 barrels; South Carolina, 4,546 barrels; other districts, 4,105 barrels.

The exports of hydraulic cement in September, 1923, were 77,121 barrels, valued at $216,564, of which was sent to Cuba, 25,928 barrels; to the other West Indies, 13,645 barrels; Central America, 14,162 barrels; South America, 12,535 barrels; Mexico, 7,574 barrels; Canada, 1,082 barrels; and to other countries, 2,195 barrels.

The statistics of imports and exports of hydraulic cement in October, 1923, are not available.



Garage necessity often calls for the presence of a bumper; but the necessity is a difficult one to meet, because it is such a shifting one. Today the bumper is needed here, tomorrow there; next day a bumper in either of these places would be a terrible nuisance, but one is badly wanted at a point where it would have been distinctly out of place before. The portable concrete bumpers which are shown in the accompanying photo are not too heavy to be shifted about with these changing necessities; yet they are bulky enough to serve admirably the purpose for which they are designed. It will be noted that each has two eyes, to which ropes or chains are attached for the purpose of dragging them from point to point as required.



Left—Up-to-date concrete equipment was used on this job. Right—Air gun as used here to make work more efficient

Concrete Helps in Pit River Project

Mammoth Western Power Undertaking Involves Many Engineering Difficulties

By C. W. Geiger

An idea of the extent to which concrete is used on the $100,000,000 hydro-electric power project of the Pacific Gas & Electric Company may be gained when it is realized that of 75,000 tons of construction material going into the Pit River Hydro-Electric Plant No. 3 (now under way), 40,000 tons represent cement.

In the transmission of the 2,400 steel towers in the 220,00-volt transmission line, 98,814 bags of cement were used. Each of the steel towers is supported on concrete foundation, five hundred gallons of water being required to mix the concrete going into each foundation. This water and cement was hauled entirely by motor trucks over many places where there were no roads.

Before construction of power plants or transmission lines could be started in the far away mountains it was necessary to build a railroad to carry the cement and other materials into the all but virgin region that had been selected for the site of the great hydro-electric project. The nearest railroad terminus was at Bartle, thirty-five miles distant, on the McCloud River railroad, which connects at its outer end with Sisson in the Mount Shasta region. For seven months in the year snow and mud made the roads between Bartle and the scene of operations practically impassable, and at best these roads permitted only the transportation of the most necessary supplies by wagon or sleigh. The engineers warmed up for the big job by building the railroad over the McCloud river divide into Clayton valley, and thence up to the Pit River to the No. 1 power site. A ten mile branch will carry the cement and other material to the site of Pit Power Plant No. 3. Immense storage bins for the proper storage of the cement are provided at the terminus of the ten mile branch railroad.

Mammoth Undertaking

The first big unit of the Pit River power development (The Pit River Power Plant No. 1) was completed and placed in operation last year. The second unit Pit River Power plant No. 3 is now under construction.

The first unit cost $10,000,000 and has the capacity for developing 93,000 h.p. When the program of construction is finished some 13 years from now an aggregate of about 600,000 h. p. in installed capacity will have been bridled on a sixty-mile stretch of river and at a final cost of something near $100,000,000.

In order to divert water from the river for operating the turbines of Pit River Plant No. 1, a concrete diversion dam five hundred feet in length was built on the Fall River and from this an intake canal one thousand feet in length and with a capacity of 1,800 feet per second was constructed to bring the water to the east portal of a concrete tunnel 10,160 feet in length, 14 ft. 3 in. in height and about 13 feet in width. At the west portal of the tunnel, facing Pit River, was built a large reinforced concrete tank or "surge chamber" about 55 feet high and of 60 feet inside diameter. From this, huge steel penstocks tapering from 10 ft. 9 in. in diameter at the intake to eight feet at the power house were laid upon the hillside to convey the water to the water wheels. The penstocks are 1,357 ft. in length and connect with two concrete tunnels fifteen feet in diameter of 185 feet long, which lead the water under ground to the power house.

The rock from the 10,160 foot tunnel was piled at the top of the hill, where a rock crusher was installed which crushed the rock into aggregate to be transported down the hillside in dump bottom cars to a bin located near the power plant. A track extended across the penstock. Rock and sand for the penstock anchors were carried by dump bottom cars running on this track. The sand was dumped into a bin on the right side of the tracks and the crushed rock into a bin on the left side. These two materials were run into the cars simultaneously and were hauled up the hillside by means of a cable operated by a hoist located at the top of the hill.

Building Is Artistic

The power house, built of steel and concrete, is an impressive and handsome building, since the company does not see that beauty and utility need be divorced. It is tall, battlemented and castle-like, suggesting enormous strength, and faces a deep cut in the earth walled up with black rubble, from which a canal leads to the Pit River.

Left—The concrete diversion dam, five hundred feet long. Center—Circular concrete surge chamber, sixty feet in diameter. Right—Concrete table for keeping logs from floating back to water wheels.

Pit River power plant No. 3 is rather more complicated than the Pit River No. 1, as it not only involves the construction of a considerably greater length of tunnel, but also requires a good sized dam for its successful completion. This dam will be 110 feet in height, creating a reservoir 32,000 acre feet in capacity, of which the

Looking down slope toward surge chamber, showing location of concrete mixer and tower.

top six feet only will be used for pondage. The dam will back the water up some ten miles. It would, of course, be possible to obtain approximately the same amount of head on Pit No. 3 by constructing a conduit, a matter of some fifteen miles longer, but the dam offers a far less expensive solution of the problem, in that it reduces the required length of conduit to a little over four miles.

The dam will be of reinforced concrete "Ogee" type with its axis on a very flat arch. Normal plant regulation will be obtained by means of two syphon spillways which will be constructed as integral parts of the dam proper. In addition radial gates with a total quantity of not less than 50,000 second feet will be installed to take care of flood condition. The spilling for the project as a whole will be done at this point, the concrete surge chamber, eighty feet in diameter, to be designed to care for the actual surge only, instead of the entire flow as was possible at Pit No. 1. The intake structure will consist of two large slide gates, the area of the trash rack opening in connection with the same being of generous proportions.

From this intake the water will be led into a concrete lined tunnel nineteen feet in diameter and having a total length of about 21,000 feet. This tunnel will be of circular and horseshoe section, as was the case at Pit No. 1, and its large diameter will permit a steam shovel to be used, thereby effectively speeding of the construction.

The Tunnel

The tunnel as now planned will have a capacity of 3,000 second feet and will lead the water into a surge chamber set somewhat off of the tunnel line and thence into the three penstock pipes which will guide this water to the power house below. Butterfly valves will be installed in the penstock just below the surge chamber to aid in the matter of water control, these valves to be housed in a suitable structure.

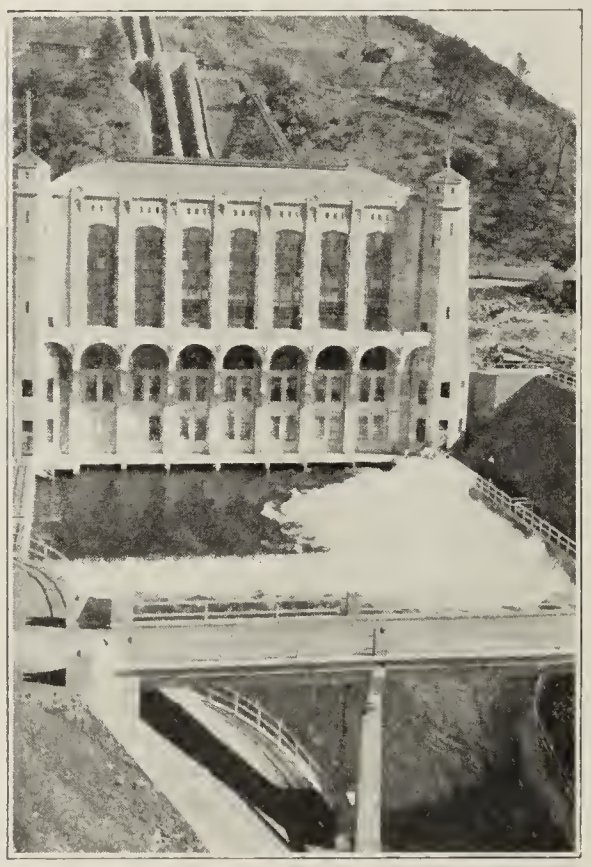
At the bottom of the hill the penstocks will enter the power house through three tunnels approximately 155 feet in length, the space over these tunnels to be utilized for the outdoor transformers and oil switches which will be installed. The power house proper, to be of concrete construction, 47x194x62 feet, will be built along lines similar to that at Pit No. 1, the length being somewhat increased to accommodate the three units which are to be installed.

One interesting feature of the power house design is that the elevation of the tail water level permits bringing the turbine floor to approximately the level of the ground in the vicinity of the power house, thus rendering it possible to dispense with the generator floor. The generators will be supported on concrete pedestals extending up from the turbine floor level, from which latter point the plant will be operated.

The location selected for the power house is ideal for the purpose inasmuch as the land adjacent to the lower end of the project is fairly level, wooded and will provide an ideal setting for not only the power house itself with its comparatively short tailrace leading to the river, but for a clubhouse of the high standard set by the company and a sufficient number of operators' cottages. It is believed that the result will be one of unusual utility and beauty.

The history of this $100,000,000 project dates back to 1917, when the Pacific Gas & Electric Company purchased the properties of the Mount Shasta Power Corporation, whose activities were centered upon a hydro-electric project on Pit River at Big Bend. The purchasing company undertook at first to complete this, but conditions arose which brought about changes in plans.

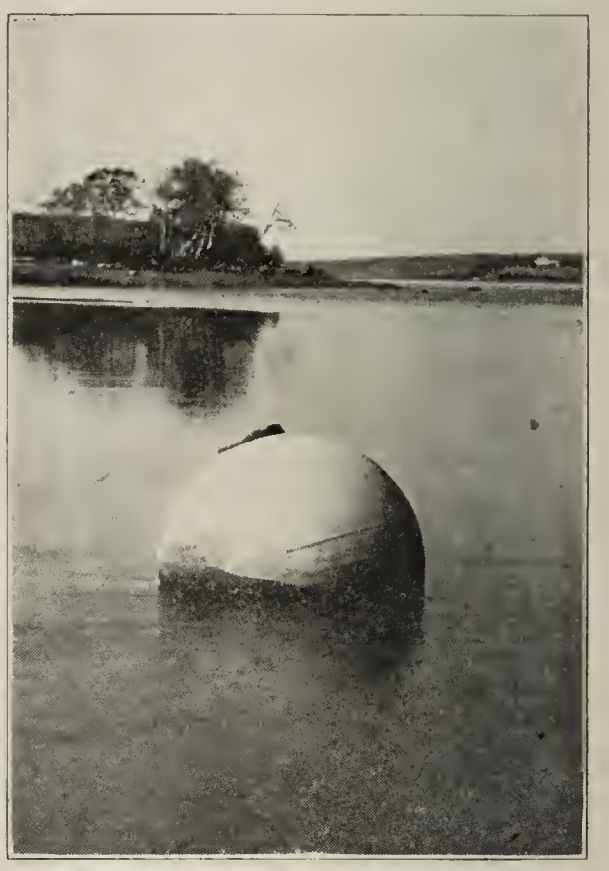
A succession of dry years had almost dried up the Sierra streams, and it was



Front view of power house.

necessary that the company find additional power on short notice. So the Big Bend project was abandoned for the time being and a move was made further up stream, which would enable the immediate construction of two preliminary plants on Hat Creek, and a chain of developments on the River, leaving the Big Bend as the last link of the chain. The Hat Creek plants were placed in full operation in September, 1921.

Hat Creek Power Plant No. 1 is a steel reinforced concrete structure equipped with a 15,000 h. p. vertical turbine direct connected to a 12,500-kva. generator. Hat Creek No. 2 is a concrete structure and the power equipment is identical with Hat Creek No. 1, but owing to additions to the flow from Crystal lake more power is obtained.



Perfects Concrete Mine

E. E. Solderholtz, of West Goldsboro, Maine, who, for a number of years has devoted himself to the production of the highest class ornamental concrete garden furniture, has recently perfected a spherical reinforced concrete mine of more than usual interest. Mr. Solderholtz has developed the "spinning" method of casting symmetrical concrete products to a high state of perfection and employs it regularly in the production of spindles, shafts, sundials, vases and similar objects.

The marine mine shown in accompanying illustrations was produced by spinning in a spherical metal mold. It was originally conceived for use in the world-war but only recently perfected. There is an outside layer of concrete, three-quarters of an inch thick, inside of which is a layer of asphalt one-eighth inch thick and a second layer of concrete one-half inch thick, reinforced with light metal fabric. The mine is designed to weigh 365 pounds and to retain bouyancy when loaded with 200 pounds of T. N. T.

After several months' trial floating in Frenchmen's Bay, the mine was recently examined and found in perfect condition. The principle demonstrated is equally applicable to any mine which there is a constant commercial demand in times of peace as well as war.

Upper Left—Method of disposing of excavated material. Upper Right—Arrangement of concrete mixing plant at the south shaft. Center—A view of the two shafts on either side of the canal. Lower Left—A view of the north shaft and the equipment in use. Lower right—Shaft concrete forms.

Concrete Tunnel Protects Pipe Lines

How an Engineering Company Crossed an Important Waterway by Means of a Concrete Siphon

An inverted concrete siphon under the Indiana Harbor Canal at East Chicago, Ind., was required by the Sinclair Pipe Line Company to carry the pipe lines from the Wyoming, Kansas and Oklahoma oil fields to refineries at Whiting and East Chicago, Ind. The siphon was constructed in order to avoid changes due to dredging in the canal and also to have the lines at all times accessible for repairs and to avoid deterioration of the pipe line due to impurities in the canal water.

The siphon in cross section was an arch top tunnel seven feet by seven feet, with a short section near the north shaft that was ten feet by ten feet, in order to facilitate the handling and assembling of the long lengths of pipe. Entrance to the tunnel is made through two ten foot concrete lined shafts about 65 feet in depth. All of the excavation from the tunnel was taken out of the south shaft and piled near and will be used as a top covering for the tops of the fire walls of the adjacent tank farms.

The shafts were thirteen feet outside diameter and ten feet inside of the concrete lining. The first 25 feet of excavation for the shafts was through very fine water bearing sand with a few layers of fine gravel. On the south shaft the next ten feet was composed of a tough soft clay containing a few small stones, but on the north shaft the excavation was different, as the south half of the shaft was through a very hard tough clay while the north half for about five feet was through a black muck in which several red cedar logs were found. The remainder of the shafts was through a tough clay containing a large percentage of small stone and slate. Little water was encountered after the shafts were sunk about fifteen feet into the clay.

Wood sectional forms in four foot sections were used in forming the concrete shell of the shafts. A cutting edge was used on both shafts made of an angle 4x4x½ and a 24x$\frac{3}{8}$ inch plate, with $\frac{5}{8}$ inch by 36 inch anchor bolts spaced 24 inches apart. The concrete was reinforced with ½ inch square bars 24 inches apart both horizontal and vertical.

The construction equipment for the south shaft consisted of a traveling crane eleven feet gage with a forty foot boom for handling a half yard Kiesler clamshell bucket, operated by a 7x10 D. C. D. D. steam American hoisting engine. Air for the pneumatic shovels used in the excavating work and for ventilation of the tunnel was supplied by a 10x10 Laidlow Dunn Gordon steam air compressor with a 60 inch x 6 foot air receiver. Steam for the compressor was supplied from the hoisting engine. Water for the boilers and for concrete was supplied by a 2 inch Domestic Engineering Company gasoline pump connected a well point system. Concrete was mixed in a quarter yard gasoline driven Koehring concrete mixer and placed in the shaft forms with a bottom dump bucket.

The equipment for the north shaft consisted of a sixty foot mast guyer American derrick with a fifty foot boom for handling a half yard Owen clamshell bucket, and was operated by an 8x10 D. C. D. D. Lambert steam hoisting engine. Concrete was mixed in a quarter yard Marsh Capron gasoline driven mixer and placed in the shaft forms with a bottom dump bucket. Water for the north shaft was supplied from the pump on the south side of the canal through a 1½ inch pipe laid across on the bottom of the canal.

The shafts were sunk by the open dredging method to near the top of the tunnel and were then underpinned to the bottom. Several small "washins" occurred in both shafts caused by sticks and flat stone getting under the cutting edge and cutting a small channel on the outside of the shaft. Two sets of forms were used on each shaft for forming the concrete and were left in place about forty-eight hours. A steel ladder extending from the bottom to the top was placed in each shaft for use in entering the tunnel for inspection.

Tunnel excavation was handled from the south shaft and was nearly all in tough clay containing small stone and slate, in this material the ordinary method was to mine and concrete six feet in a shift of nine hours, and as two shifts were operated per day the rate of progress was twelve feet. A few small sand pockets were encountered and through these the mining, timbering and concreting was done in three foot sections. Three Chicago Pneumatic Tool and Ingersoll Rand pneumatic shovels were used in the heading for excavating and the muck in the tunnel was handled by two muckers and two car pushers on each shift. Three laborers on top dumped the muck and mixed the concrete.

Steel ribs made of 2-6 inch channels with angle lugs at top and bottom for bolting together and 2x6 inch wood lagging with beveled edges were used for the forms for the concrete lining of the tunnel. Excavated material was handled in one-half yard steel V shaped side dump cars on a track of 16 lb. rail 14 inch gage resting on 4x4x36 inch ties thirty inches apart. The cars were handled on a 5x4 foot elevator operated by a steam hoist.

Gravel concrete was used on all of the work of a 1; 2½; 4 mix, the concrete for the tunnel was handled by the one-half yard steel cars used for the excavation and then shoveled and tamped into the forms, a medium dry mix was used in the tunnel. Concrete inserts were spaced ten feet apart in the shafts and tunnel to provide for future pipes.

Four lines of pipe were placed in the tunnel and shafts consisting of 2-12 inch and 2-8 inch. Piping in the tunnel resting on precast concrete blocks spaced ten feet C to C and braced in the shafts with 2-6 inch channels spaced eight feet apart. All of the pipe in the shafts and tunnel was welded in place on the pipe rests. Ample space is available in the tunnel to provide for additional lines. The north shaft is connected at the top with a 12 inch pipe extending through the fire wall of the adjacent tank farm so that if a break occurs in any of the siphon lines the oil will flow out inside the fire wall. The shaft tops of both shafts were extended above the tops of the fire walls.

A small steel building resting on a concrete foundation was built near the south shaft to house the valves and header lines of the different pipe lines and an electric pump was installed to take care of any oil leaks should they occur in the siphon lines. At present the tunnel is dry and there is a strong current of air in the tunnel.

Lines for the tunnel construction were established by the contractor with heavy plumb bobs suspended in the shafts. The work was commenced on June 16th and the tunnel "holed through" on September 15th. The estimated cost of the work was $100,000.

The siphon was designed and constructed by the Subway Engineering Company of Chicago, Ill., for the Sinclair Pipe Line Company, of Tulsa, Okla. The piping was placed by the Pipe Line Company and all of the work was under the supervision of Frank Hadley, chief engineer, W. E. Brewer, division engineer, and H. S. Joyce, resident engineer for the Sinclair Pipe Line Company.

Building Active

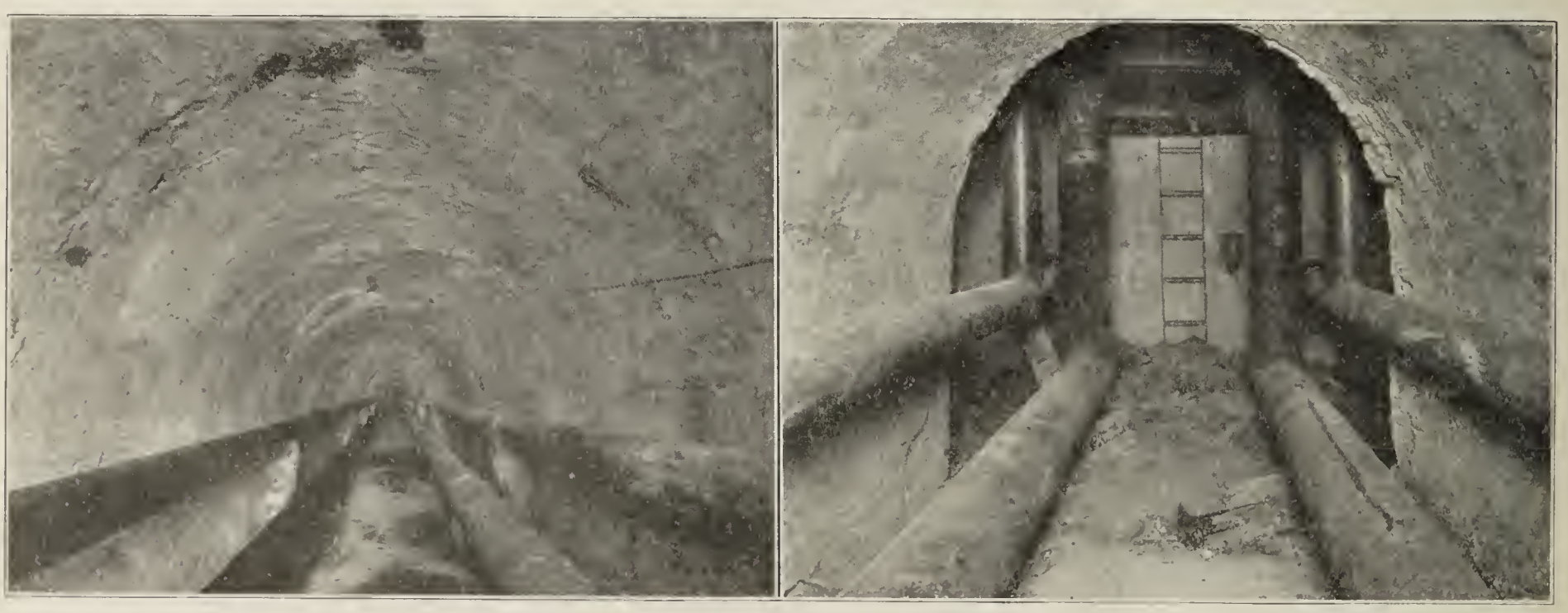
The country's building activities continued their lead over last year through November, according to F. W. Dodge Corporation. Total contracts awarded during the month in the 36 Eastern States (including about ⅞ of the country's total construction volume) amounted to $318,828,000. Although this was a 12% drop from the October figure, in 27 of these states (for which records were kept last year), there was an increase of 19% over last November. As in October, the heaviest increase in construction activity was in New York State and Northern New Jersey, which was the only district showing an increase over October. The recorded figures on building volume in October and November indicate an unusually busy winter for the construction industry.

Included in last month's record were the following important items: $158,593,000 or 50%, for residential buildings; $44,457,000 or 14%, for industrial buildings; $36,237,000, or 11%, for public works and utilities; $32,594,000, or 10%, for business buildings; and $24,273,000, or 8%, for educational buildings.

Total construction started in the 36 Eastern States during the first eleven months of this year has amounted to $3,237,068,000. In 27 of these states the lead over the corresponding period of last year is a little more than 3%.

Contemplated new work reported during the month amounted to $623,704,000, an increase of 10%, over the amount reported in October.

The Lakewood Engineering Company, of Cleveland, Ohio, announces that sale of its construction and paving equipment has been placed in the hands of Brown & Sites Company, 30 Church Street, New York City. From 1912 to 1916 this company represented the Lakewood Engineering Company, and is now again taking up the line.



A cross section of the tunnel showing arrangement of pipe with precast concrete block pipe supports. Right—A view at the bottom of the south shaft showing pipe risers.

News of British Cement Activities

By W. Hamilton Gordon, London Correspondent

The British Prime Minister, Mr. Stanley Baldwin, has adopted an out-and-out policy of protection for British industries. Parliament is being dissolved and a general election is to be held on December 6th, when the electors will be faced with the plain issue: protection by tariff versus free trade. It is true that the labor party say that their pet theory, the capital levy, will be a vital issue, but I think they are exaggerating the amount of support they are likely to get. To introduce a full protective tariff, Mr. Baldwin has to obtain for his party, the Conservatives, a clear majority over the two free-trade elements in parliament—the liberals and the labor party. If he does so the cement industry will certainly be one to receive protection in the tariff which will be introduced to function from the commencement of the next fiscal year in April, 1924. Thus, certainly, the next few weeks, and possibly the next few months, will disclose events likely to have a vital influence on all British industries.

Mr. G. A. Watson, chairman of the Ship Canal Portland Cement Company, in his address to the shareholders at the annual general meeting, made some interesting remarks about American methods. Discussing the point of why the United States, whose production not so many years ago was negligible, is now producing and using twenty-five million tons of cement per annum, whereas the United Kingdom productive capacity has stood still at about three millions and is at present below that figure, he gave the reason that the United States, being a comparatively new country, wisely adopted the very commodity that lends itself to construction work of all kinds. He had had light thrown on the paucity of demand in this country as compared with the ratio of demand in the United States through the visit of a prominent American engineer who recently came to Europe to study the conditions prevailing in the cement industry in this country and on the Continent.

This gentleman mentioned that he was particularly impressed by the absence of co-operation between the manufacturers and all interested in cement in this country. The manufacturers by their attitude seem anxious to kill the industry and go out of their way to belittle cement made by their competitors, thus discouraging the engineer and architect to use portland cement, because, if by their selling propaganda manufacturers put users, architects, surveyors, etc., against other brands of cement by running them down, they are doing the industry an injury in bringing doubt to their minds as to cement being a satisfactory building material.

In the United States the manufacturers have conventions arranged with the sole object of creating good feeling between all parties interested in cement; they boom the industry, and give everyone interested confidence in the use of cement as a building material to be relied on. So much for this criticism, which may have some foundation as regards the relations between the manufacturers but, I, personally, can testify that the cement industry is reaping considerable benefit through the campaign carried on by the Concrete Utilities Bureau, with a view to interesting possible users in concrete as an all-around constructional material.

The Empire Exhibition

Next year the annual convention of the Associated Advertising Clubs of the World is to be held at the British Empire Exhibition at Wembley, on the outskirts of London. Over 6000 delegates from abroad are expected to attend and more than 2000 of these will be from the United States. The exhibition itself, which will contain specimens of raw products and manufactured goods from all over the British Empire, will be one colossal advertisement for reinforced concrete as far as its structural part is concerned.

The flooring of the different buildings is of reinforced concrete, 4 inches thick, to allow for loads of 1½ cwt. per square foot and point loads of three tons. In the Palace of Industry, which has a floor area of 500,000 square feet, the structure is based on units of 25 feet. The main portion of the building consists of 50-foot span arches constructed in reinforced concrete at 25-foot centers. Seventy-five-foot span arches have had to be built adjacent to the main gangways and these are composite, being 3-inch steel arches with reinforced cantilever abuttments, no tie rods being necessary.

In the Palace of Engineering—which is the same size—the construction is much the same, but the structure has to carry five 25-ton electric overhead cranes of 75-foot span. Reinforced concrete is used for the crane gantries, and beams with the stanchions placed at 25-foot centers. The buildings themselves are a combination of reinforced concrete and cement breeze blocks. The exposed reinforced concrete which had to be constructed in place was not touched after the moulds were removed, as the usual board marks were done away with by using a reeded form of shuttering. This latter has given a grooved surface and light and shade effects to the concrete.

Some other concrete objects at the exhibition will be enormous flagstaffs bearing patterns of crowns and jewels, lampposts, fourteen big bridges, and a million-gallon water reservoir. In all the constructional work concrete is said to have answered satisfactorily and economically every call made upon it.

Centrifugal Packing

Further to my recent note about iron pipes with concrete linings, the Stanton Iron Works Company, of Nottingham, who manufacture them, also make a specialty of what is called the Stanton-Hume reinforced concrete pipe. In turning out this latter a thin sheet iron mold is first built up, and inside this a spiral wire reinforcement is fixed. The mold is then placed on vertical rollers and commences to rotate at a high speed, and while it is running a suitable concrete is thrown in at the ends of the mold until the pipe is of sufficient thickness. Centrifugal force not only causes the pipe to form but expels the moisture from the concrete, the latter very rapidly becoming a dense mass.

After only a few minutes the pipe is complete, the mold is removed from the machine and the whole thing is placed in a steam bath and left for about eight hours. Then the concrete is considered to be sufficiently hard and the mold is removed, the pipes being placed in the open to season for about a month. The actual effect of the rapid spinning during the process of manufacture is to produce a very dense concrete which protects the spiral reinforcement most effectively and also forms a thoroughly waterproof pipe. Unless required to carry exceptional pressure the pipes are usually tested up to 150 pounds to the square inch.

It is claimed that the Stanton-Hume system is a very great improvement over the ordinary method where concrete is passed in between inner and outer molds and rammed home. In this latter case the pipes often prove to be porous, as the concrete lacks sufficient density, while excessive ramming may displace the armed reinforcement. The makers claim that under this new system the pipe has a smooth inner surface, reducing friction, that it is non-porous, and that its breaking-strain is much higher. The standard sizes in which these pipes are being made varies between 4 inches and 72 inches in diameter and 3 feet to 10 feet in length.

Rumored Cement Stock Coup

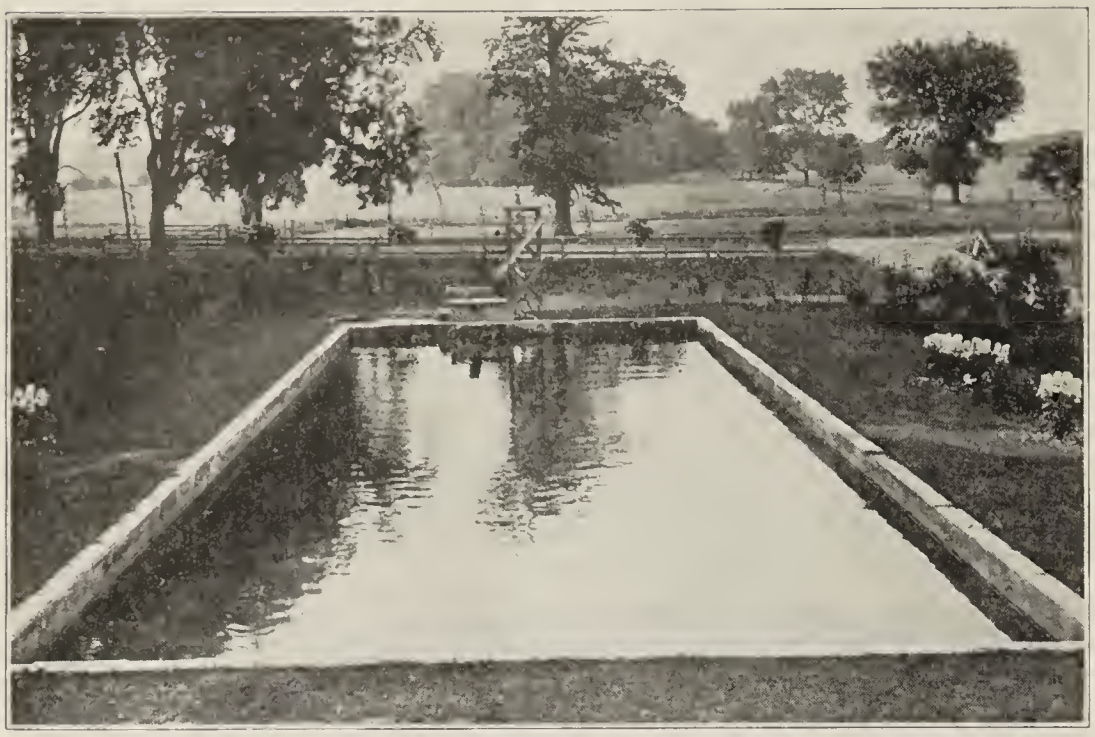
Quite a sensation has been caused in financial circles recently by the rumor that an outside syndicate has acquired a controlling interest in the Associated Portland Cement Manufacturers, Ltd. This latter concern is the "big noise" in the British cement world, having control of the British Portland Cement Manufacturers, Ltd., and owning the Talteca Portland Cement Company and the Kent Portland Cement Company. It has an issued and paid-up capital of £4,541,935 and has issued debentures to the value of £4,541,935. Recently a concern financed jointly by British and American capitalists, and with the title of the Anglo-Atlantic Corporation, has been purchasing all the shares in the Associated Portland Cement Company which were obtainable and their prices were continually forced up. An official of the Associated Anglo-Atlantic received certain representatives of the press and opened his heart freely to them.

He talked about a big campaign being commenced with a view to adapting cement to hundreds of new uses that modern engineering has discovered for it. He insisted that Britain produced the finest cement, but had always been content to wait for trade to come instead of going out after it, and that she was far behind other countries from the commercial viewpoint. He referred to the new era in transport which has already commenced, in which a complete reorganization of the British road system is visualized and indicated that there is nothing so efficient for such a road system as concrete.

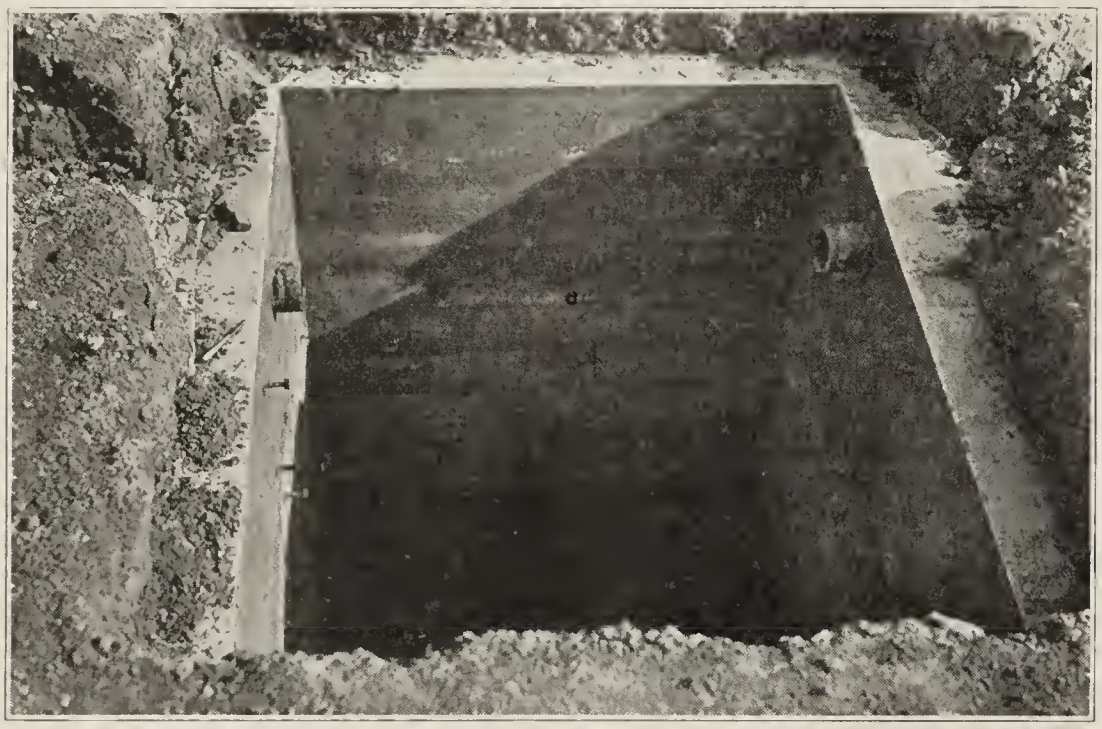
Cement, according to him, which had been in the past a sleepy industry, is really a key industry, and in the cement age which his syndicate hoped to inaugurate, it will have an enormous influence in stimulating other industries. Seeing all this in the papers, the Associated Portland Cement Company, which controls about 90 per cent of the cement output, woke out of its trance and stoutly denied that it was under the control of the Anglo-Atlantic. So the mystery deepens, but the general opinion in financial circles is that the margin of control either way is now very slight indeed and that the buying of shares which is still going on is due to the efforts of the contestants to obtain or retain control. The campaign to get control of the Associated is said to have been planned by a young stock broker, Mr. Henry S. Horne, who has stealthily been buying his syndicate in for three years without any notice being taken of his activities.

(Continued on page 50)

Concrete Uses on the Farm



An attractive and modern tank supplants the "old swimmin' hole" on today's farm, affording a healthy and safe means of recreation.



Concrete septic tanks now handle sewage from the rural home. Country life is no longer unpleasant because of pollution and offensive odors.

Concrete tile outlet and dirt dam. Concrete tile running across the field takes the place of a former open ditch, now filled in. This is an economic practice on high-priced land.

Concrete clothes line poles are more satisfactory for the farm wife. They look better and are not liable to decay, as is the case with the wooden predecessor.

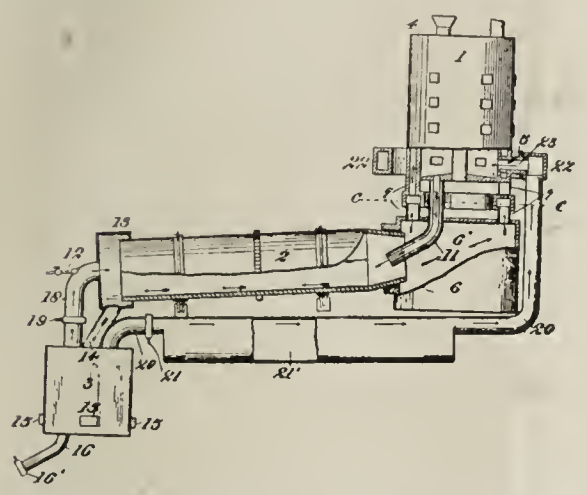
A concrete block milk house and a concrete water trough on an up-to-date dairy farm enhance the appearance as well as the utility of the equipment.

Interesting Cement Patents

Recent Patents of interest to readers of Cement and Engineering News specially prepared for this publication by Clarence A. O'Brien, Registered Patent Attorney, Security Savings & Commercial Bank Bldg., Washington, D. C.

1,468,168. APPARATUS FOR CALCINING AND CLINKERING. Robert D. Pike, San Francisco, Calif.

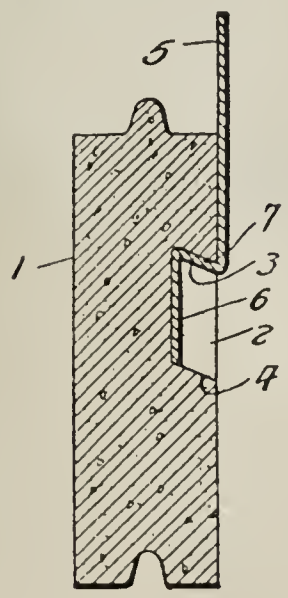
6. An apparatus for the described purpose, the same comprising a calcining element provided with upwardly extended flues communicating with the interior thereof at points above its zone of combustion, a clinkering element, means for conveying the products of combustion therefrom into the upwardly extending



flues of the calcining element, an annular flue interposed between the clinkering element and the calcining element provided with a series of outlets communicating with the interior of the calcining element within the sphere of its zone of combustion, a cooling element associated with the clinkering element, and means for conveying air directly from the cooling element into the said annular flue for discharge into the calcining element for supporting combustion therein.

1,468,544. TILE AND FASTENING MEANS THEREFOR. John T. Pratt, Tiptonville, Tenn.

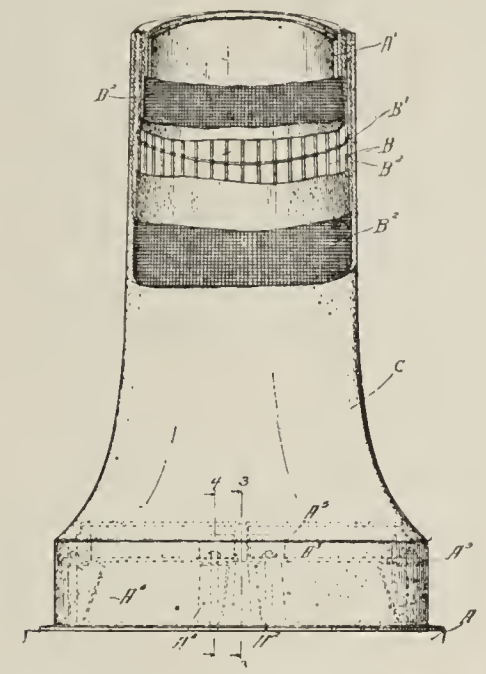
1. In combination, a tile having a recess in its rear side, the upper wall of the recess extending upwardly and forwardly,



a cleat having a shoulder fitted against said wall intimately, and a key depending from the shoulder and coacting with the lower wall of the recess to wedge the cleat in place.

1,469,712. PROCESS OF CONSERVING AND REPAIRING CHIMNEYS. Frank F. Beeby, Chicago, Ill., assignor to Cement-Gun Construction Company, Ill. a Corporation of Illinois.

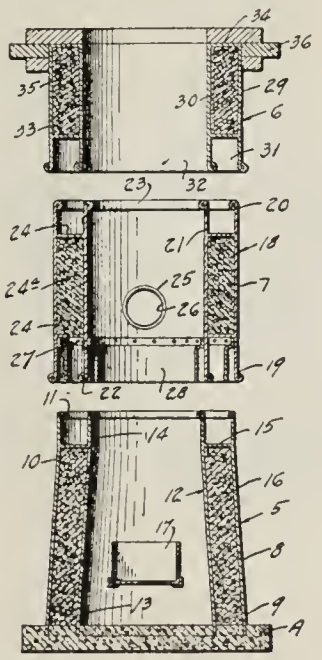
1. The process of constructing about a chimney already in place a second chimney which consists in placing reinforcing about such first chimney, spacing the same from



such chimney, mounting such reinforcing upon a foundation at the base of such chimney anchoring said reinforcement to said foundation and placing upon and about such reinforcing and about such first chimney concrete to form such second chimney.

1,469,030. CHIMNEY. John A. Watson, Cincinnati, Ohio, assignor of one-half to Joseph H. Sheick, Cincinnati, Ohio.

1. A chimney comprising a plurality of sections, each section embodying an inner and outer tubular wall, spacing means dis-



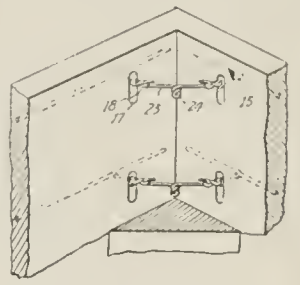
posed between said walls, said means coacting with the walls to provide a compartment for the reception of heat insulating means, the end portions of said sections telescopically engaging the end portions of the adjacent sections.

1,468,029. PLASTIC COMPOSITION. Charles Noll, Cleveland, Ohio.

1. A composition for making plaster containing slaked lime, clay silica sand, flour, and cement.

1,468,285. CONCRETE-SLAB BUILDING CONSTRUCTION. Gerald Francis Dampney, Sydney, New South Wales, Australia.

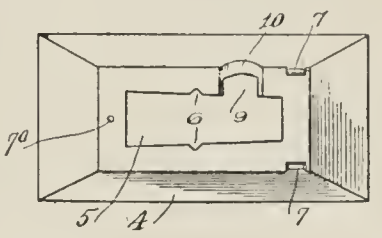
1. A concrete building slab having reinforcement members embedded therein and tying attachments connected to said members, said slab being provided with cavities to accommodate said tying attachments whereby the latter may be extended beyond



the surface of the slab to facilitate the tying of opposite and contiguous slabs in the erection of the same.

1,469,198. ANCHORING INSERT FOR CONCRETE STRUCTURES. Edward McTowe, Rochester, N. Y.

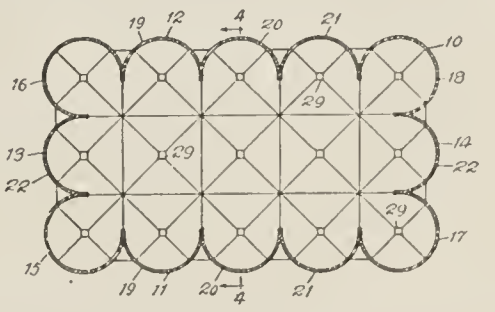
3. An anchoring insert comprising a body having an opening in its bottom wall, the



walls of the opening having provision to produce a lateral pressure on two spaced pins extending through the opening when the body is moved relatively to the pins, and having means for interlocking with the pins after such movement, and a projection carried by the bottom face of the insert adapted to be driven into a wall from which the pins project after the insert has been interlocked with the pins.

1,468,647. BUNKER. Charles Paff, New York, N. Y.

1. A bunker, comprising a chamber supported above passageways, said chamber having walls composed of joined corner sections and intermediate sections, the corner sections being curved throughout three quadrants thereof and the intermediate sections being substantially semi-circular, the chamber having a bottom composed of a series of substantially cone shaped pockets arranged so that the wall of each pocket



serves as a separate bottom for the part of the area of the chamber embraced within and adjacent each curved section of the wall of the chamber, and gate controlled outlets in the apices of the pockets, leading to the passageways.

New Publications

The Aurora Pump & Manufacturing Company, Aurora, Ill., devotes its new thirty-two-page catalogue No. 200 to a discussion of applying the various described centrifugal pumps to specific requirements. Nine pages of tables, included in the booklet, make it a valuable asset to anyone dealing with pump problems.

The Chain Belt Company, of Milwaukee, Wis., has devoted a forty-four page booklet to a description of the newer models of Rex pavers, concrete mixers built for unusually heavy service.

The S. G. Taylor Chain Company, No. 140 S. Dearborn St., Chicago, has recently issued a new thirty-two page booklet telling how Taylor chain is made and what may be expected of it. Helpful hints and tables are also included.

Bulletin No. 300A, just issued by the National Lime Association, Washington, D. C., gives interesting information on lime and lime-cement brick mortar.

C. J. Tagliabue Manufacturing Company, No. 18 Thirty-third street, Brooklyn, N. Y., has published a comprehensive sixty-page catalogue, No. 640-A, dealing with thermometers, recorders, and monoflue gas recorders, efficiency devices applicable to any plant using fuel. Copies may be obtained on request.

The question of how to proportion the ingredients in designing concrete mixtures is an important one. How much cement, how much sand, how much gravel or broken stone, and how much water must be used to secure a specified workability with the particular materials that are to be used? Many views have been put forth concerning the factors which govern the strength of concrete, and quite divergent opinions have been advanced, all of which have resulted in considerable confusion in the minds of engineers as to what constitutes the real influences in the makeup of concrete and as to proper ways for specifying the quality of the aggregates and for proportioning the mixtures.

"Observations on an Outstanding American Industry—Cement," by Edward Hungerford, is a new booklet published by the Portland Cement Association. It could well be called "The Romance of an Outstanding American Industry," for it develops through its pages the narrative of the rapid strides made by portland cement in the past hundred years in climbing from obscurity to the strata of modern necessities. It describes the process of manufacture and tells of experiments leading to its more efficient use. In this connection a well-earned tribute is paid to Prof. Duff Abrams, who has directed noteworthy work in connection with cement research.

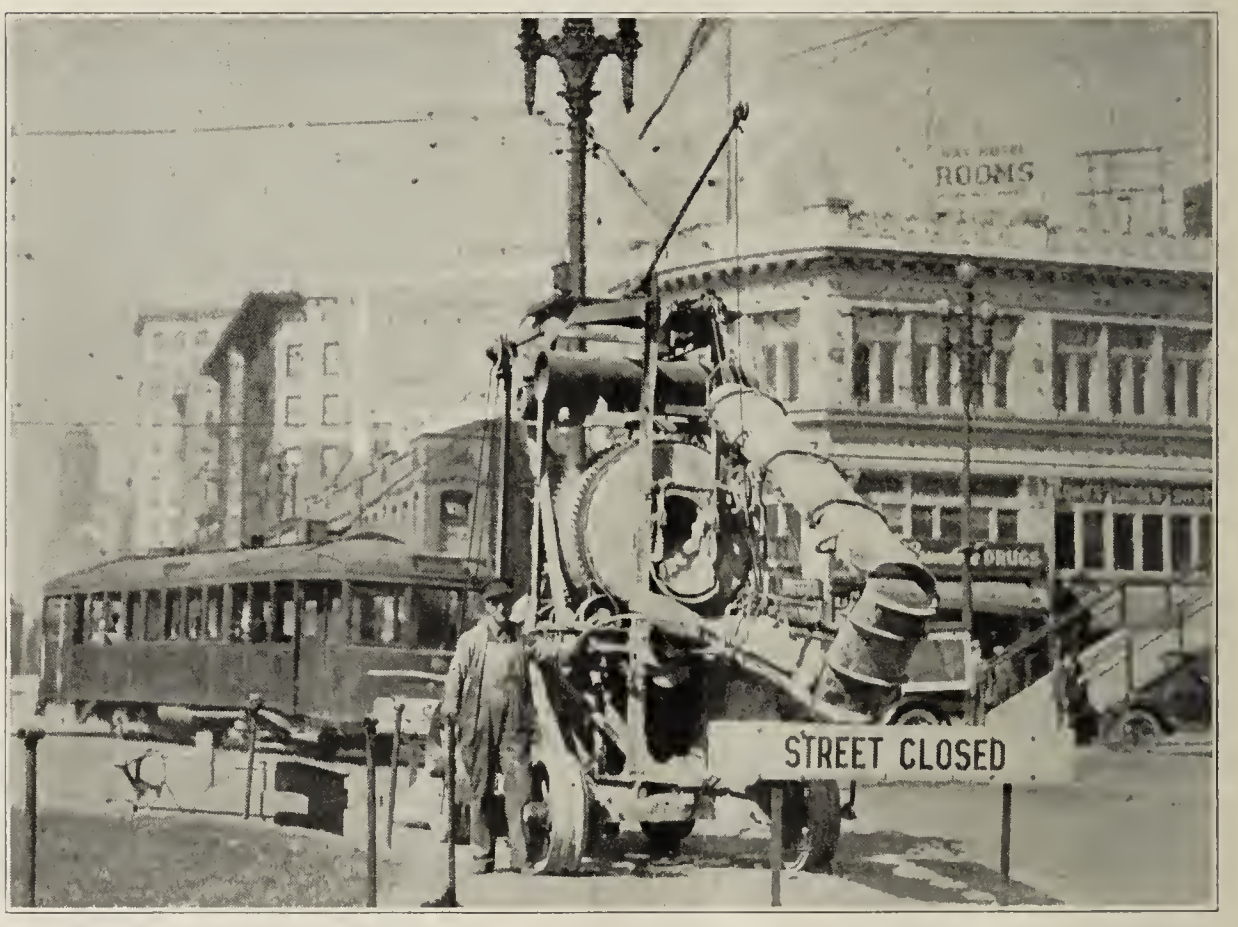
Bulletin No. 137, just issued by the Engineering Experiment Station of the University of Illinois, enunciates relations between the compressive strength of the concrete and the amount of the cement and voids contained therein. It develops methods for studying the concrete-making properties of fine and coarse aggregates and for the comparison and acceptance of aggregates. It outlines means for designing concrete mixtures for different densities and strengths when the voids in mortars made up with a given cement and fine aggregate have been determined by laboratory tests. Means are suggested for estimating the effect upon the strength and density of concrete that accompanies an increase in the amount of mixing water beyond that which would give minimum volume to the concrete. Analytical relations are developed and the technique for the proposed tests are described. The results of tests of mortars and concretes made up with a variety of fine aggregates are recorded and the accuracy and applicability of the methods discussed. The test data cover a considerable range—a variety of aggregates, different proportions of cement, and different amounts of mixing water—and the significance of the results is discussed. The application of the methods and principles deduced to design, specifications, and field use is considered. Copies of Bulletin No. 137 may be obtained without charge by addressing the Engineering Experiment Station, Urbana, Ill.

Bulletin 80-X of the Pawling & Harnischfeger Company, of Milwaukee, Wis., attractively illustrates the various uses to which the company's gasoline and electric shovels may be put and depicts the difficulties which the machines may be expected to encounter successfully. The booklet, consisting of thirty-six pages, is available upon request.

A bibliography of magnesian cements, by G. H. West. R. L. Sebastian and W. A. Darrow, has just been issued by the Department of the Interior through the Bureau of Mines. This bibliography was compiled in the course of research work by the Bureau of Mines on the utilization of the magnesites in the West. The result of the research will appear later as a bulletin of the bureau. The present bibliography cites 211 references relating to analytical methods, physical and chemical properties of magnesium and calcium compounds; calcining operations and manufacturing of magnesium oxide or hydroxide; constitution of magnesium oxychloride cements; practical preparation of cements; tests and specifications; magnesite statistics, etc.

"Finger Tip Talks," the new booklet of the Grant Leather Corporation, Kingsport, Tenn., describes "Slip-Not" belting, known for its tenacity and grip.

Novel Concrete Mixer



Reconstruction of the tracks of the Market Street Railway in San Francisco on its line from Sutter Street to the Embarcadero on Market street presents an interesting problem in modern methods of track laying and the placing of the concrete.

Track work is being carried on at night as the headway between street cars during rush hours is too short. Between the hours of 11:45 p. m. and 5:45 a. m. all passenger cars are kept off two of the four tracks.

In installing the concrete base for the tracks the company uses a concrete mixing machine that has been modified and improved by its engineering department, making it possible to run under its own power on the new track with temporary feeding platforms laid on the tie rods. This machine takes the rock, sand, concrete and water from in front and after thoroughly mixing them, deposits the concrete through a chute which is adjustable and permits the placing without additional handling. The machine is equipped with an electric motor that both propels and operates the concrete mixer, current being obtained by means of an ordinary trolley pole and wheel operating similar to that of a street car.

Here and There In the Industry

George D. Loomis, head of the Loomis Machine Company, of Tiffin, Ohio, recently died. He was seventy-six years old.

The Sonoma Gravel Company, of Santa Rosa, Cal., has incorporated for $30,000. The directors are H. H. Elliott, W. B. Combs, and W. P. McFaul.

The Peerless Portland Cement Company is planning the erection of a 1,500,000 barrel plant at Detroit, Mich., at an estimated cost of $3,500,000.

The new 1,000 barrel plant of the Sun Portland Cement Company recently began production. F. L. Knappenberger is superintendent of the plant .

The first of the three kilns for the New Yosemite Portland Cement Company plant at Merced, Cal., arrived on the site recently and is now being put into place.

The Olympic Portland Cement Company, of Bellingham, Wash., recently replaced its 39,000 barrel water tower with one of concrete whose capacity is 62,000 barrels.

Construction of new plant of the Yosemite Portland Cement Company, near Merced, Cal., is progressing satisfactorily. Installation of machinery has already begun.

Engineers from several gravel companies are investigating the feasibility of dredging the Russian River, near Guerneville, Cal., because of the gravel shortage in some of the bay cities.

W. J. Chandler has been appointed advertising manager of the Lehigh Portland Cement Company, Allentown, Pa., to succeed H. M. Eichelberger, who resigned on November 1.

The Guadalupe Portland Cement Company closed recently for 259 acres near San Jose, Cal., according to press dispatches. The consideration was said to be about $70,000.

Dana Pierce was recently elected to the presidency of the Underwriters' Laboratories. A. R. Small was chosen vice-president, D. B. Anderson, secretary, and L. B. Headen, treasurer.

The Vulcanite Portland Cement Company, Vulcanite, N. J., recently floated a $600,000 issue of first mortgage twenty year sinking fund 7½ per cent gold bonds. They are due November 1, 1943.

Bids on practically four million barrels of cement were recently rejected by the Illinois department of public works because prices were thought to be too high. New bids were asked for December 10.

The Dewey Portland Cement Company, of Dewey, Okla., has enlarged its plant by the addition of another kiln. Another battery of concrete storage tanks is also being constructed to bring the storage capacity up to 120,000 barrels.

E. W. Hilker, of Granite City, Lacy Peyton, of Benton, Jacob Bosch, of Chicago, George Zeigle, of Peoria, and Gil Cooper, of Joliet, were recently elected to the general advisory council of the Concrete Products Manufacturers of Illinois.

The Associated Portland Cement Manufacturers, Ltd., which controls capital to the amount of $13,000,000 and nearly 90 per cent of the British cement industry, has passed to a newly registered company, called the Associated Anglo-Atlantic Corporation, whose chairman is Sir Philip Nash, according to an Associated Press cable from London.

The Guadalupe Portland Cement Company was recently incorporated at San Jose, Cal., for $3,000,000. Robert Dunlap, L. J. Pope, Luis De Amechazurra, Esben Broe, and F. G. Cartwright are named as directors.

The Wisconsin Lime & Cement Company recently purchased 257 acres of land between Cary and Crystal Lake, Ill., on the Chicago & Northwestern Railroad. The company plans the production of torpedo sand and gravel at the new tract. It will have a capacity of about sixty cars a day when production is started next spring.

O. F. Barklage, of the Industrial Sales & Engineering Company, has been appointed representative of the Weller Manufacturing Company, Chicago, makers of conveying and handling equipment, at Omaha, Neb. Stratton-Cahoon Company will represent Weller interests in Salt Lake City, Utah, and F. A. Klopp has been placed in charge of the Baltimore office.

"The Cement Manufacturers' Association has been ordered by the Supreme Court to dissolve.—Isn't it queer that the associations of employers, formed for the purpose of increasing what they might otherwise be able to get for their products if competion were unbridled, are the ones always to be frowned upon by the law and by the courts, while those organized by labor for exactly the same purpose of exacting all the traffic will bear and then some, never seem to engage the vision of the regulators? For they are there, all right, and they are engaged in that sort of business regularly, and in worse because they are an absolute tyrannical monopoly denying to others a right to invade their business. Hence the miserable showing we are making in the building line with bankers' salaries for all hands engaged in it, and a sort of take-it-or-leave-it attitude."

—*San Francisco Commercial News.*

According to the annual report of the director for the fiscal year 1923, the work of the Geological Survey has covered effectively the broad field assigned to that organization, embracing geologic and topographic surveys, the study of mineral deposits, the collection of statistics of mineral production, the measurement of the flow of streams to determine the quantities of water available for use and to provide information needed for projects designed to prevent floods, the study of available ground water, and the classification of the public lands preliminary to the issue of patents or leases.

More than 40 per cent of the United States has now been accurately mapped topographically, a large knowledge of its geologic features and mineral resources has been gained, and widely extended studies have been made to discover geologic processes, especially those that determine th accumulation of mineral deposits.

During the year the survey distributed nearly a million and a quarter publications, of which nearly 600,000 were sold, and performed about $100,000 worth of lithographic work for other branches of the Government.

The Service Rock Company, of Fresno, Cal., recently leased six hundred acres of gravel and sand land near El Paso on the San Joaquin River. Three hundred thousand dollars will be spent for equipment. The pit is located in a gold bearing country, so that it is expected that at least $2,500 worth of the precious metal will be obtained as a by-product each month.

Blaw-Knox Company, Pittsburgh, Pa., announces that after December 1st, Charles K. Wehn will be in charge of a special department devoted to Blaw-Knox standard steel buildings and structural steel in Illinois and adojining states. In any construction problems of this nature Mr. Wehn will be available for consultation and personal engineering service. His headquarters will be in Blaw-Knox Company's Chicago office, Peoples Gas Bldg.

The Shipping Board has advertised for sale a concrete vessel, the Gilley Ledge, which was wrecked off the coast of Maine. Bids on this ship will be opened by the Department of Ship Sales in Washington on Dec. 3. This ship is one of a number of vessels which are described as obsolete or otherwise unfit for service and which are put up for sale to be scrapped. The vessels are to be sold on the condition that they will not be operated, but that they shall be dismantled and scrapped in the United States within one year.

Joins Chain Belt Company

Chain Belt Company, Milwaukee, manufacturers of Rex chain, conveyors, transmission machinery and concrete mixers, has announced the appointment of Ralph C. Bird as special sales representative for cement mills. Mr. Bird has been connected with the cement industry for approximately twelve years and is widely known. For the past six years he has been associated with the Bradley Pulverizer Co. in the sale of grinding machines. As special sales representative of the Chain Belt Co., he succeeds G. O. Curtis, now connected with the International Portland Cement Corporation, New York.

How Dependable Are Forecasts?

(Continued from page 21)

to a close, men invest in bonds which, although they carry fixed interest returns, are likely to have a larger yield than the common stock of a company which is shutting down. We must remember, however, that in watching Wall Street barons we have two chances of falsely predicting. In the first place the money lords may merely be manipulating securities for profits on the actual transactions rather than on interest. Then too, they may all be honestly predicting conditions which do not come about as they had expected. They are merely human beings and are liable to mistake as are any of the rest of us.

We have one, by one, taken up the usual basis of business forecasts as they are used today. We have intentionally stressed the weakness of each to show that no matter how good it may seem at first sight, it cannot be absolutely relied upon as an absolute forecast of future conditions. Forecasting is by no means an exact science. We cannot predict future conditions with mathematical accuracy. We should not rely upon the opinions of those who seek to do so and sell their services.

There Is no Magic Way

Statisticians are valuable and they give real value for the fees they exact. But they are no better prophets than you are. Buy their figures, but interpret them for yourself. We can profit by buying statistics which reflect at a glance what industry is doing, but we should not try to buy brains. We should use our own.

After all, our own interpretations of the valuable figures we buy are the best. Professional prophets themselves disagree as to what their statistics mean. Like the oracles of ancient Greece, they often couch their meanings in phrases which may be interpreted a number of ways. No matter what happens they can often say "I told you so." Independence of analysis and thought pay the greatest dividends.

Cement in Art

(Continued from page 27)

difficulty was overcome by bringing about a change in consistency while the concrete was in the mold. The core was so constructed that it would extract the excess water but at the same time leave sufficient for the hydration of the cement. Although the most important parts of the work, such as heads and arms, were at the top of the molds, the most difficult position to fill the concrete showed no tendency to shrink away from the mold owing to the extreme density developed when the excess water was extracted.

"Periodically we do something in the surface treatment of concrete which seems to be interesting and encouraging and which you kindly write me to describe. On these occasions I always bring to you the same message, namely, that concrete has in itself and of its own nature properties, which if skillfully developed and controlled, will make it the most satisfactory architectural and artistic medium ever known."

Our London Letter

(Continued from page 45)

Favor Concrete

Mr. E. O. Williams, one of our leading concrete constructional experts, who has been responsible for the structures at the British exhibition, has been talking about building possibilities of the present and future with his favorite material—reinforced concrete. He makes the point that it is no longer necessary to cover a great structure with a stone face. If it were proposed to rebuild one of London's bridges over the Thames, reinforced concrete would undoubtedly be the material used for the purpose, for it would not only be cheaper and quicker to construct the bridge with this, but the structure would also be lighter. It will be the same, he says, with other structures, even cathedrals, for there need be no ugliness with reinforced concrete; it will evolve an architecture in keeping with its rugged needs.

The chief inspector of factories and workshops, in his recently-published annual report, has a great deal to say on dust inhalation in various industries, its harmful effects, and the steps which should be taken for its reduction. The cement industry is implicated to some extent though, fortunately, it is not branded as a highly dangerous occupation like the grinding or pottery trades. However, the sacking of cement has always been considered a very dusty process in England, but the chief inspector makes an interesting reference to a new machine which has practically abolished the dust. In this machine the sack is placed around the mouth of the feed in a metal chamber and the door is closed. A vacuum is then produced in the chamber which causes the cement to be drawn from the silo into the sack. The flow is automatically stopped at the correct weight and a small fan removes any dust that may remain. The door of the chamber can only be opened when the operation is entirely completed and the vacuum has been broken. He considers that this machine is of great value and hopes to see its general adoption throughout the industry in the interests of the cement workers.

W. Hamilton Gordon.

Concrete brick made this Idaho Courthouse both beautiful and lasting.

The Shoshone County court house, at Wallace, Idaho, in addition to being a very good example of concrete masonry construction, has the distinction of being the only building other than the reinforced concrete railway station remaining in that thriving county seat city after a fire which started in nearby forests and swept over the town.

Although doors and window frames were charred, and decorations discolored, requiring expenditures of $1500. for replacements and repairs, the beautiful building, built in 1906 at a cost of $82,000. was not otherwise damaged. All of the main walls are of concrete block, made by the Synstone system, for which local mine tailings were used as aggregate. The architectural trim is also of concrete while floors and roof are of reinforced concrete slab construction. The block and trim were made by the Wallace Concrete Company which has since gone out of business, although the president of the concern, Mr. Herman Rossi, is one of the leading business men of the city.

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